## Canadian Government Surveys.

(*Concluded from page 102*).

BY D. L. S.

Written for ENGINEERING NEWS.

The system now pursued by the Department of the Interior of Canada in, laying out Dominion Lands is, as far as we can judge, very near the perfection of practical surveying. Following is a short outline of the method, as laid down in the "Manual of Dominion Land Surveys."

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| 31 | 32 | 33 | 34 | 35 | 36 |
| 30 | 29 | 28 | 27 | 26 | 25 |
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A TOWNSHIP.

"The Dominion Lands are laid off in quadrilateral townships, containing thirty-six sections of 640 acres, of one square mile in each, subject to the deficiency or surplus from the convergence or divergence of meridians, together with road allowance of one chain on every section line running north and south and on every alternate section line running east and west."

"The lines bounding townships on the east and west sides are true meridians and those on the north and south sides are chords of the parallels of latitude passing through the corners of the township."

"The lines bounding sections on the east and west sides are true meridians and those on the north and south sides are lines parallel with the north and south boundaries of the township."

The townships are numbered in order, northerly from the International Boundary, and they lie in ranges which are numbered east and west from a line called the principal meridian, and west from other lines called second, third, etc., initial meridians according to their order westward from the principal meridian.

"The sections are laid out of the precise width of eighty chains on certain lines called "base lines," and the meridians between sections are drawn from such bases, north or south to the depth of two townships, to "correction lines," (on which the jogs resulting from the want of parallelism of meridians are allowed). The sections south of the base lines measure therefore more than eighty chains, while they measure less north of the same line. The interval between one base line and the next is equal to the depth of four townships.

"The first base line is the forty-ninth parallel of latitude; the second base is between townships four and five; the third between townships eight and nine, and so on." The first correction line is between townships two and three; the second between townships six and seven, and so on."

"Each section is divided into quarter-sections of 160 acres more or less.

This system has been followed in almost all surveys made in the northwest and Manitoba, with the exception of Indian reserves, half-breed lands, and lands fronting on the larger rivers.

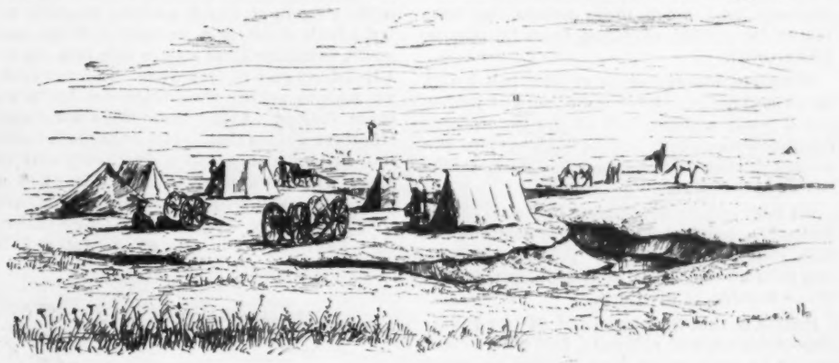
The limits of townships and sections are marked on prairies by planting iron posts, and throwing up around them pyramidal mounds of earth from rectangular pits dug for that purpose. Squares of tin, having stamped on them the section, township and range numbers, are slipped over the tops of the iron posts.

In and near places where timber is found, wooden posts are used, (no mounds being raised where the post comes in the timber). All lines are run along the south and west limits of road allowances.

Before any portion of country is divided into townships and sections, the land is laid out in "blocks embracing four townships in longitude and the same in latitude, or sixteen townships in all." The block lies between two base lines and its east and west boundaries are "broken lines consisting of two meridians separated by the "jog" on correction line."

"The north and south limits are parts of a polygon described on a parallel of latitude by laying off as chords thereto the successive township sides."

All lines must be measured twice with steel band chains; the leading chain a 66-foot one, the following chain used only as a check on the first, to be 100 feet long. If there is a difference in chaining a mile, of more than two links on prairie, or three links in bush, the line must be remeasured. The chainage must be corrected for temperature. All distances measured by triangulation must be checked by another independent operation.



SUNDAY IN CAMP.

GETTING INTO THE CONTRACT.

The instrument to be used by the surveyor in charge is "a reiteration transit-theodolite with a 6-inch horizontal circle reading by three verniers, to 0°.004, and a 3-inch vertical circle with two verniers to 0°.02 as a finder for stars in daytime."

Azimuth observations must be made on Polaris, and the surveyor is expected to observe every fine day.

When the blocks have been laid out by the block surveyors, other surveyors are appointed to divide them into townships. A steel band chain must be used for this work also; but the instrument need not read any closer than to single minutes, and the observations may be taken on the sun for azimuth.

Both surveyors of blocks and of township outlines are expected to send in monthly reports of progress, accompanied by sketches. Their final returns will consist of:

1. A diary for the time the surveyer has been employed.
2. Plans of survey on a scale of forty chains to an inch, on the forms supplied.
3. A copy of field notes.
4. A record of astronomical observations.
5. Oath of chainmen.
6. General report of survey.

Block surveys and outlines are paid by the day—all expenses for labor, outfit, etc. being met by the Government. The subdivision of the townships into sections to make them ready for sale and settlement is done by contract (careful and accurate work not being so necessary at this stage.) The lines are run at so much per mile, the price varying from about six dollars to ten dollars according to the nature of the country they pass through. The schedule of prices is fixed by the department from the reports of block surveyors and outlines.

In return for this sum the contractor must pay all expenses of survey, and send in field notes and plans before April the 1st, of the year following the commencement of his contract. If, however, he can get the survey made and the full returns sent in before Jaunary 1st, he is entitled to a bonus of 15 per cent. of the whole contract price. On securing the contract the surveyor must provide the necessary sureties, and then a sum will be advanced to him sufficient to enable him to begin work. He is also allowed to draw on the Government during the progress of the work, to the amount of 85 per cent. of the value of the work performed provided he sends sketches to the Department showing what he has done.

In the year 18—, one of the years of the survey "boom," partly by our own strenuous exertions, and chiefly by the influence of friends, who knew how to influence the Department of the Interior, we were fortunate enough to succeed in making a contract with Her Majesty, the Queen, for the survey of certain townships in certain ranges west of the Third Initial Meridian. So after hiring two assistants who had been out with us before, and on whom we could depend, we left our home in Eastern Canada, and travelled through Ontario, through Michigan, Indiana and Illinois to Chicago; from Chicago to St. Paul; and from St. Paul, through a country always becoming less populous and more barren looking, to Winnipeg. A dreary

enough looking place this was when we reached it, in a steady rain. The unpaved streets, axle deep, and the crossings ankle deep in blue mud, with enough of the same material on the sidewalks to make top-boots or leggings the only suitable covering for the lower extremities. But it improved very much on acquaintance, being a stirring place for business, and much more substantial than might have been expected from its fungus-like growth.

Winnipeg was full of surveyors—this being, as we said before, one of their years of jubilee—and many a dollar out of the government advances was then finding its way into the money drawer at the stores, hotels and bar-rooms of the city.

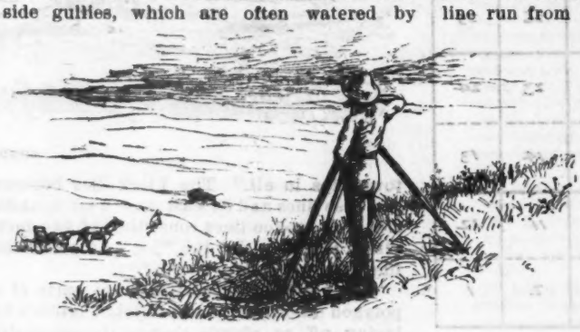
We were sufficiently prudent not to stay there long—just long enough to hire some of the men required and to buy provisions, etc.—and then we moved on to Regina, the capital of the Northwest territory.

Regina at that time consisted of two streets almost destitute of sidewalk, laid out at right angles to each other, and flanked by small wooden buildings. The Pile-of-bones river that runs—or rather stands—by it, is nearly dry in summer; and the flat prairie round about is not picturesque, though it has the reputation of being a good farming country. Here we finished making up our party (eight in all), bought horses and carts, and hired a box-car to take the whole outfit to the station where we intended to stop, and whence a march of thirty miles would bring us to our work. In this new country the fact of there being a station does not imply the existence of a settlement. The one at which we stopped was like most of the rest; the telegraph operator's house (a box about 10 feet square) and the tank for supplying the engines with water, were the only buildings, and the operator and the tankman were the only inhabitants.

Here we unloaded our car and made camp—the first camp on the prairie; and here our troubles began by the best horse breaking loose from his hobbles and giving three of the men a 10-mile chase in the dark before he was caught. The next day we began to move. We had four native horses, Indian ponies—tough little creatures, that will work hard all day, and yet keep in good condition on no food except the grass they can pick up at night or when resting. They were harnessed to a buck-board and three Red river carts. These vehicles are made entirely of wood, with huge, clumsy wheels, turning on thick axles; each wheel shrieking at every turn like a dozen ungreased wheel-barrows. The carts and buck-board were loaded with the surveying outfit, and provisions enough to last four or five months; weighing altogether about two tons, or half a ton for each vehicle; quite enough, considering the size of the horses, the style of carts, and the absence of made-roads. A moderately good road may, however, be found almost anywhere, the only obstacles being steep hills and creek-beds.

From the beginning of our trip we encountered considerable trouble from these; for the young horse harnessed to the buck-board generally stopped half-way up a hill and had to be shoved up the remaining half; while one of the cart-horses almost invariably sat down in the middle of a creek, and could only be induced to move after much persuasion in the form of boots and clubs.

Our first day's march was over rolling prairie, with alkaline ponds in the hollows—most of them fairly alive with quacking ducks and screaming plovers, which made splendid sport for the shot-gun and furnished us with many a bouillon. In the afternoon of the second day we reached the township we intended to begin work in; and encamped in a small gulley, that furnished wood and water, and lay on the south side of one of the huge valleys that are so common in parts of the northwest; 200 feet below the level of the surrounding prairie, and nearly a mile wide, it had evidently been once the channel of some great stream, of which nothing remains now but a little creek, or a succession of stagnant pools, wriggling from side to side, in a bed 3 or 4 feet deep and 10 feet wide. The townships we had to survey were traversed by two of these valleys. Along their sides were many tributary gullies that led into the main valley, like little streams into a river, only that the place where water should be was filled up with grass and bright flowers and stunted shrubs and trees. The trees are found in these side gullies, which are often watered by springs; but the springs are drank dry by the thirsty ground before reaching the creek-bed in the valley. Except of these gullies and valleys, the country was rolling prairie, broken in open places into steep, round-topped hills; and all covered with grass, scanty except in the valleys, where it generally grew luxuriantly. The trees were all small poplar and willow, and these grew only in particular places, so that we had to send sometimes ten miles or so for fuel. Many kinds of beautiful flowers grew on the gravelly hills and in the richer soil of the low lands. This was the country we set about laying out into townships.



THE ONLY BUFFALO.

SCOTTY AND THE WOLF.

Our party consisted of two chainmen, a picketman, two moundmen, a cook and one extra man for providing wood, carrying mail, etc.

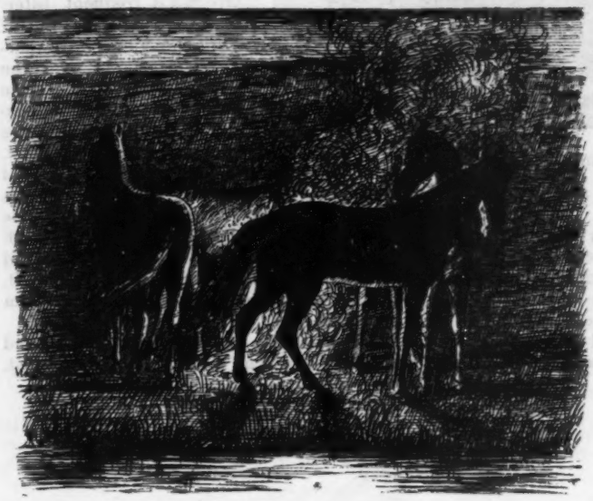
A transit was used to run the lines (no instrument but transit, theodolite or solar compass is allowed by government) and the measuring was done by an ordinary Gunter's chain with steel links. Early in the morning the surveyor, taking a picketman and two chainmen, would start off with a horse and buckboard, carrying wooden pickets, and iron posts enough to mark the section corners on the lines to be run. Arrived at the township boundary, and the mound marking the proper section-corner being found; part of the boundary (half a mile or a mile) would be run to get its bearing, and from this line the angle it made with the meridian would be turned off. A line would then be run north or south from one boundary, the chainmen measuring after the instrument, and planting section posts and marking position of quarter-section mounds temporarily, till the opposite boundary was reached. If the line so run passed through the mound made by the outlines on this boundary, and if it proved to be the proper length, then the posts would be left as planted. But if, as generally happened, there proved to be some discrepancy, the trial line had to be corrected. For instance, suppose a line run from the south measured eighteen links short, and passed thirty links east of the outline mound. The whole line being six miles long, this would give a correction of one and a half links in length and two and a half in bearing for every half mile. So, going back over the line, the surveyor would move the nearest picket, marking position for the quarter section mound, sixteen and a half links south and twenty-seven and a half west, the nearest section-post, fifteen links south, and twenty-five links west, and so on back to the south boundary of the township.

A straight line divided into twelve equal parts would then be drawn from post to post on the outlines of the township. Along this line the moundmen would go the following day, with pick and shovel, and build the mounds at the points marked out for them. The east and west lines are generally run by joining posts on meridians by a straight line, and dividing this line into two equal parts to get the one quarter section corner.

In this way we ran from six to eight, and sometimes even ten miles a day on open prairie. Pickets were placed as far apart as possible, for pickets were precious. To render them more conspicuous a sod would be cut out and stuck on top, or better still, a buffalo skull. The remains of buffalo could be picked up almost anywhere in this part of the country, and, together with the buffalo runs, (deep-cut paths these animals have made in their journeys over the plains) gave evidence of the vast number that must once have pastured there. They are seldom seen now and we considered ourselves fortunate in getting a sight of one.

We were just starting to work one day after our noon rest when we noticed a black object moving along about a mile away. When we turned the telescope on it, we saw it was a buffalo. It came galloping straight towards us till within an eighth of a mile, when running over a little hill it came upon the picketman, who was ahead of the rest in his cart, and swerving off suddenly it went out of sight over the hills to the south. This was probably a straggler from one of the small herds whose members can now be counted by units, where not long ago there were thousands.

We saw many antelopes in this part of our contract, feminine creatures, beautiful, timid, full of curiosity. They appeared sometimes singly but generally in small families or herds. Fox-like coyotes and gaunt prairie wolves were by no means scarce, and used often to serenade us in the most dismal manner at night. They did not often show themselves in the day time; but once, when chaining a line, one of the chainmen, a canny, short-sighted Scotchman, looking about for



HORSES IN FLY TIME.

something to mark a quarter section corner for the moundmen, saw what he took to be some buffalo bones or a stone lying in the tall grass of a muskeg. It was a wolf, and Sandy's look of consternation when the yellowish gray mass jumped up with a snarl a couple of yards from him, was something to be remembered. The only other kind of four-footed creatures that were at all common were the little gophers that could be seen everywhere

A CREE ENCAMPMENT.

playing jack-in-the-box at the mouths of their holes. Birds were very plentiful—not singing birds, but principally birds of the hawk kind, and swimmers and waders, geese, ducks, plovers, snipe and gulls.

Before we had been at work long the weather became very hot in the day (it is always cool enough at night to wear blankets) and the mosquitoes and blackflies came out in full force. They were never really troublesome to us, however, as in the bush, except in low places where the grass grew long. We could always pitch our tents on high ground. But in these low places the horses had to graze, and many a night we were roused by a regular stampede among them, when maddened by the attacks of the insects they galloped, hobbled as they were to the higher ground near camp to find relief. We used to quiet them by building a smoky fire or smudge at their feeding-place; and round this they would gather close to get rid of their tormentors.

We soon began to adopt a regular system of working, which was this: camp would be made near the north or south boundary, and in the middle between the east and west boundaries of the township to be surveyed. The lines would all be started from the boundary nearest camp; run through north or south to the opposite boundary, and connected back, the connection ending on the part of the line nearest the starting point,—that is to say, nearest camp. In this way one camp-spot would do for the survey of one and sometimes of two entire townships; and the trips to and from work never exceeded two or three miles.

On an average one township a week would be surveyed, and then the outfit would be packed in the carts and a move made to a similar position in the next township.

It was on one of these moving-days that we first made acquaintance with the natives. We had left camp in the morning to finish one township while the cook and moundmen moved to the next one. Coming back in the evening we struck what we supposed to be the trail of their carts, and followed it for 2 or 3 miles, till, rounding one of the conical hills that formed the surface of the country thereabouts, we came upon an Indian camp—two huge teepees or wigwams of buffalo hide standing by a muskeg, with papooses and dogs playing under the wooden carts, and the ponies grazing near by. We had evidently gone the wrong way, so we turned round and soon struck the trail leading to our own camp, a mile or so further north. Near this camp we saw several piles of stones on the hill-tops, marking the places where Indians had been buried. The moundman one day brought us the skull of a child and a necklace of copper buttons they had found while digging.

Towards the completion of this part of our contract the weather grew hotter still, and at the same time water became more scarce and less drinkable. What we got began to affect us all so that we could scarcely keep any food in our stomachs, but vomited after every meal. A keg of water was generally carried on the buckboard, but one intensely hot day we had to leave camp without any, expecting to find some in the hills toward which our line was ran. Not a drop could we get and our thirst was almost unbearable. In the afternoon the chainmen, who had the hardest work, first one then the other fell sick, and had to lie down in the shelter of the buckboard. So we unharnessed the horse and, taking the keg, mounted him and let him go. The thirsty brute jogged off in a pretty direct course for a couple of miles and then took us straight to a muskeg among the hills. Filthy water it was—full of weeds and the larvae of insects, and coated with green slime; but it was quite good enough to enable us to finish our day's work. Except for a few weeks, however, we never really suffered for want of water.

About this time we got a letter from the Department, offering us in extension of our contract, the survey of a number of townships in the Cypress hills. This offer we gladly accepted, as some months of the very best weather for surveying still remained. The day before starting for our new work we had an early visit from five vagabond Crees. They were

THE COOK'S VISITORS.

probably on a horse-stealing expedition, or else trying to recover horses stolen from them, for they were on foot and carried nothing but guns, lariats and whips. After begging a hearty breakfast they borrowed a pot from the cook and, producing a number of ducks they had shot, put them in it, entrails and all; then when about warmed through, devoured them, regardless of the meal just finished. These noble red men were dressed in the usual fashion of northwest Indians—moccasins, wide blanket-leggings with ridiculous flaps at the sides, breech-clout, shirt and blanket. Their back hair hung down in one or two greasy plaits, while the front was banged in the fashionable Langtry style. We gave them a small present of tobacco, and bade them good-bye, taking care to keep a good watch on horses and camp for the remainder of the day.

The next morning we packed up and started for the C. P. Railway, where the main cart-trail was, along which we intended moving to the Cypress hills. Travelling west on the trail we reached Swift Current on the morning of the third day, and stopped there to replenish our stores and refit. At that time the best

AN ASSINIBOINE BELLE.

buildings in the place were wooden stores, but many more were of canvas than of wood. Round these, and along the banks of the Swift Current creek, were stretched hundreds of teepees and tents, the homes of Indians and half-breeds. Many of the Indians here were Assiniboines. They were much more gaudy in their attire than any we had hitherto seen. The unlimited use of paint—yellow, red, green and black—heightened the natural charms of their greasy countenances; and some young braves, whose clothing had once been white, were so bedaubed with yellow ochre that they

looked like gigantic smoked hams. One old Indian, whose dress consisted of a small piece of blanket, a breech-clout and a wild-goose wing, claimed to be a medicine-man, and delighted our men so much that they gave him their small change, one bit at a time for the pleasure of hearing his "Hi! Hi!" "Hi! Hi! Hi!" increasing the number of exclamations as each piece was given him.

THE MEDICINE MAN.

We left Swift Current late in the afternoon, and travelled four or five miles before making camp. When we woke up the next morning our horses were not to be seen. We lost nearly a day before we found them in a gully among the hills lying southwest from Swift Current.

INDIANS ON THE TRAIL.

Then we moved on, passing Goose lake, where the tank is supplied by a pipe from a spring in the hills; by Crane lake where for some miles we travelled through a country swarming with harmless reptiles—lizards, snakes and frogs; past Colly (a coaling station) and Hay lake to Maple creek, the next place of any importance west of Swift Current. Here were the same wooden stores, and the tents and teepees, and besides a large encampment of the northwest Mounted Police. While waiting here we were overtaken by a number of our friends, the Swift Current Indians, who came straggling along the trail, most of the men on foot; the squaws in carts or on horseback, carrying their papooses behind the horses' heels, wrapped in buffalo robes stretched between two teepee-poles, crossed over the animal's shoulders. This conveyance they call o-ke-o-tap-an-as, and use on a small scale to be drawn by their dogs.

At Maple creek we turned off from the railway and went south to the Cypress hills where our work lay. These hills rise on the north side steeply to a height of 1,000 feet above the ordinary level of the country north of them. This northern slope is well wooded with large poplar trees which grow in the gullies and in large bluffs. The tree from which they derive their name, a kind of pine, grows at the west end of the hills. Choke-cherries, savasse-berries and rasp-berrries abound. There is no lack of water—many fine spring creeks rising in the hills. These enter the plain below, a rapid stream, 10 feet or more in width; but they are completely lost before getting more than three or four miles north. In the valley of these streams a very luxuriant crop of grass grows, and the plateau on top of the hills is also well covered in many places.

PRAIRIE FIRES.

While in our first camp on this plateau, we passed three nights in succession of uncommon interest. On the first night a beautiful aurora appeared. Not white and cold as the aurora generally is in this country, but of a brilliant pink, that extended in grand flashes and curves far south of the zenith. So grand was the display, that every man in camp, tired though we were, lay out on the prairie till late at night to watch it. The next night we were awakened by peals of thunder, and roused ourselves to find a storm, that was terrific in a country where heavy storms are common, howling round us. The lightning and thunder were incessent; the rain poured, and the wind came in gusts that obliged us to sit on the tent-curtains and hold on to the poles. Indeed, in spite of these precautions, two of the tents were blown down and the men were left exposed to the storm. The next day was bright and sunny enough to dry the grass completely. In the evening about bed-time a fire that had been smouldering for some days in a bluff about a mile from us caught on to the prairie grass and began working its way towards our camp. We all turned out, and providing ourselves with long green branches and wet bags, set fire to the grass near camp and burned a wide circle about our tent. In a few hours the fire passed by, but harmlessly, putting us to no inconvenience, except from the dense smoke.

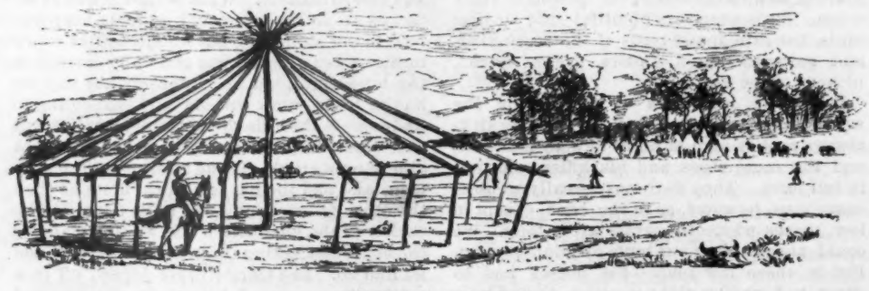
We had frequent interviews with the Indians in this part of the country. Important trails passed over the plateau, and along these the natives were continually passing. Many were the visits paid by them to the cook.

One Sunday a chief named Ke-kon-ne, gorgeously arrayed in a soldier's red coat and a pair of leggins, came and made us a formal call with a number of his band. The land round about, he said, all belonged to him. He did not wish to have it surveyed, but would permit us to lay it out if we gave him a present.

So we gave him a few pounds of flour and pork, and he went away perfectly satisfied, probably thinking that his story was fully credited.

NE-KON-NE AND HIS SUITE.

In one of the creek-valleys not far away from us, there was quite a large encampment of Indians and half-breeds,—the Indians in their miserable, dirty teepees, the half-breeds generally in good canvas tents. Quite near their camp stood the scaffolding of an immense lodge, which, covered with skins and brush, had not long before been the scene of the celebration of some of their annual dances. An old Indian from this place and his squaw attached themselves to our party in the capacity of a traveling laundry. The Indian was most elaborately tatooed from neck to waist; and the better to display his loveliness never wore any clothing on his



MEDICINE DANCE LODGE.

body except a necklace and breechclout. At the time we were there all these poor wretches appeared to be almost destitute of proper food. They lived on soup made from cherries and berries pounded up, stones and all, mixed with such small quantities of animal food as they could get by shooting or begging.

A considerable number of our lines hereabouts passed through solid bush, which de-

OUR HALF-BREED.

layed us so much that the horses were not needed, so we hobbled them and left them to grow fat on the plentiful grass.

One day after leaving the horses to themselves for nearly a week, it became necessary

MOVING.

to move camp, so we sent men to bring them in. They returned without any horses; so the whole gang left surveying and scoured the country for miles around camp in the hope of finding them. A reward was offered, and our neighbors, the half-breeds and Indians turned out in full force. But it was all of no use. Shortly afterwards we learned that a horse-stealing band of Piegans from over the Border had raided the district and run off quite a number of horses—ours among them. We immediately secured the services of one of the half-breeds (we have seen his name since among the list of those killed in the late Rebellion), a hang-dog looking fellow, who in return for a promise of the carts, buckboard and harness, gave us his own time and the use of a sufficient number of horses to carry on the work. By the aid of this man we tried to study the Cree language, but gave it up when we found that Painkiller was Maskee-see-skom-ow-kow-oik; and that when one wanted to say ninety-six, he had to say Kah-kots-mit-ah-tut-ah-mit-ah-n o-oi-w a h k-neen-goh-twah-swik.

We saw more remains of buffalo here than anywhere else, and besides buffalo, many elk and moose horns; but no living animals of any of these kinds and no antelope. Game birds were very numerous, however, there being lots of prairie-fowl among the hills and flocks of ducks, geese and pelicans in the ponds to the north of them.

As we got near the end of our work, the weather became quite cold. (The nights even in midsummer were cool enough to make blankets necessary to comfort.) At the end of September the frosts began; and the grass was well coated with hoar-frost after every clear night.

We finished our bush lines; and, after the loss of our horses, work went on swimmingly—the losing of two men for a night and part of a day being our worse mishap. We got through a line a short time before dark one day, and sent two of the men to walk back to camp, while we took the third in the buckboard and drive back along the line to correct the position of some of the posts. The sky clouded and it grew very dark long before we reached camp. We drove on as though in the right direction for a long time without reaching the tents, and had about made up our minds to camp under the buckboard for the night, Noticing, however, that the horse seemed reluctant to go in the direction we were driving, we gave him his head. He turned square off and soon took us straight into camp. The other men had not arrived, and though we fired signal guns, they did not come in that night. Next day about noon we found them in a poplar bluff about two miles from the camp.

By the middle of October we had completed the contract, moved our outfit to Maple creek, paid off the half breed, and taken train for Winnipeg where we paid off the men, and then started home to make up our returns. We left the country with a high opinion of its capabilities, even judging from the parts of it we had seen which are far from being the most fertile.

The returns of a Dominion Land Survey are similar to those already described as being furnished to the Crown Lands Department; but the former are much easier to make out on account of the completeness of the forms supplied. The system of correcting surveyors' returns also has attained much greater perfection in the Department of the Interior.

The sure, clear-headed way in which the correcting clerks ferret out discrepancies and mistakes, and find errors so small that an ordinary person would scarcely call them errors, says great things for their acuteness.

Dominion Government surveying, when the contract comprises more than a dozen townships averaging $8.00 or so a mile, generally pays better than Provincial work. Twelve townships of forty-two miles of line each, gives a gross return of over $4,000 for the section outlines. In this we may generally add a few hundreds for traverse lines round lakes and rivers, which are paid for at a rate about 25 per cent. higher than than for section lines. But of course the extra travelling expenses, and the extra cost of food, etc., help to equalize things.

In spite of the loss of horses, we made something worth having in the trip we have just described; and, if we have not been there since, it is not because we don't want to go.

---

ANOTHER coal mine has suffered a cave-in, this time at Scranton, and it is probable that several lives are lost thereby. There are laws made to guard against these accidents, but they are not always enforced as they should be, and there is constant need of the most rigid inspection of the condition of mines. There is great danger in them at best, and it is probably impossible to exercise such care that there shall never be any accidents and loss of life.

## Water Way for Culverts.

PROVIDENCE, R. I., Sept. 4, 1886.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reply to "J. M. R." in the *Railroad Gazette* of Sept. 3, I would say that Clemann's "Railroad Engineer's Practice" gives the following rule, by Major E. T. D. Myers, for sizes of culverts:

$$"A = c\sqrt{M}"$$

"In which $A$ is the area of the opening of the culvert in square feet, $M$ is the drainage area in acres, and $c$ is a variable co-efficient, depending on the country, and for which Major Myers recommends 1.6 in hilly, compact ground, and 1.1 in comparatively flat ground. In mountainous countries this may often be increased to 4."

WATERMAN STONE.

[The question raised by this letter is discussed in the following article.—EDITOR ENGINEERING NEWS.]

## The Proportioning of Culverts.

It is natural for fallible man to wish to reduce everything to rule, even if it be only a rule of thumb. The responsibility of the individual is much diminished if he have something of that kind to lean on, and in so doubtful a matter as the proper size of culverts this is especially natural. It is well, however, to be certain that we are not simply making a rule where there is no rule, and so lay the foundation of future trouble, and we must confess to doubts as to whether this is not the case with the various formluæ for proportioning the water-way of culverts, of which that given by our correspondent as above is one of the most approved and the best known.

It is but just to premise that some evidence of value that the formula is deemed trustworthy has recently come to our hand in the form of a table prepared by the Chicago, Burlington & Quincy Railroad for the putting in of iron pipe culverts. In fact, the table is palpably prepared from Major Myers' formula unless there is a very extraordinary coincidence for taking $c = 1$ in the formula $A = c\sqrt{M}$, as Major Myers proposes, or flat agricultural country, we have the following:

| Stipulated Size of Culverts. | | | |
|---|---|---|---|
| Draining up to | Drain of pipe. | Area of waterway, sq. ft. | Proper size by Maj. Myers' formula. |
| 15 acres. | 2 ft. | 3.14 | $\sqrt{15} = 3.87$ |
| 25 " | 2 ft. 6 in. | 4.91 | $\sqrt{25} = 5.00$ |
| 60 " | 3 ft. | 7.07 | $\sqrt{60} = 7.74$ |
| 90 " | 3 ft. 6 in. | 9.62 | $\sqrt{90} = 9.49$ |
| 150 " | 4 ft. | 12.57 | $\sqrt{150} = 12.25$ |

These proportions are practically identical with those given by the formula, but it is reasonable to suppose that on a road like the Burlington they would not have been adopted unless comparison with a greater or less number of actual examples had shown that they were about what was required.

Nevertheless, as a guide for practical work we must confess that we have always regarded this formula with some suspicion, for the reason, if there were no other, that it is after all nothing more than a more learned way of guessing at it. The area drained will be ordinarily the first thing guessed at, for it is not ordinarily surveyed, and the liberal range granted between the constants "1" (for flat country) and "4" (for mountainous country) merely amounts to saying in words that "to drain an area of —— acres, the culvert should be from 6 to 15 feet span, according to the nature of the country," which brings down the assistance rendered by the formula proper to pretty small dimensions. Moreover, it is not true that, so far as experiment can be said to have determined it, the amount of water delivered per second under otherwise similar conditions is as the square root of the area drained. It is probable that it is quite beyond the reach of exact formula to express it for more than one locality, but the usual rule for proportioning sewers, if we are not mistaken, is that the delivery per second at the entrance

$$\text{to the sewer will be as } \sqrt[4]{\text{area}} \text{ rather than as } \sqrt{\text{area}}.$$

This would give us, starting from the small drainage area of ten acres as a unit:

| For an area of | A comparative delivery of water per second of | Whereas the formula makes the comparative area of culvert. |
|---|---|---|
| 10 acres | 1.00 | 1.00 |
| 100 " | 3.16 | 3.16 |
| 1,000 " | 31.62 | 10.00 |
| 10,000 " | 177.80 | 31.62 |

There is to be considered, it is true, the larger discharge of large culverts per square foot of area, but this is not very great, after the smallest sizes have been exceeded, and it would not be proper to assume any difference in head or slope of culvert.

Again, the conditions as respects rain-fall are alike in no two localities. Very great differences exist within a few miles of each other. A still more important question is this: There is, unquestionably, in drainage, as with a pendulum, what may be called an *isochronous curve* to topography, so that in some cases, whether the water falls near to or far from the culvert within the limits of its drainage area, it will reach it about the same time, the greater distance the water has to travel being made up to it by the greater rapidity with which it begins to travel, owing to the steeper slope of the ground. A continuously concave or spoon-shaped profile, including the entire basin, obviously approaches closely to this condition, and is not at all uncommon. In such cases, the form of the drainage area obviously has vastly more to do with the sufficiency of a culvert than its size.

An example on an enormous scale of the effects of such topographical conditions was afforded in the location of the Mexican Central Railway. The line of that road runs for a long distance through the heart of an open and broad valley, which is to all appearance level where the road lies, but which, in fact, slopes off gently on one side for from three to twenty miles to the river which drains, and on the other side rises as gently for an equal distance to the foot-hill of a sharply-defined and quite extensive mountainous area, half of which likewise drains into the basin. Nothing more innocent and mild can be conceived of than the whole appearance of this "flat" along the line, and even of most of the streams which crossed it. The soil was black and rich, and the few streams had light sandy bottoms, with no evidence of very great wash.

When the line was all built and it began to be tested by the heavier rain-falls, the meaning of the situation was better appreciated. Had the country been all plain or all mountain, no difficulty would probably have arisen, but, as it was, the peculiar and unusual topography had the effect of delivering the water in great sheets and all at once, without any particular regard to where the nominal water-ways were situated. The flat plains along the track held back the water falling near to it and prevented its prompt delivery. The steep slopes miles away started the water along promptly, and the more promptly the farther it fell. The effect was that the capacity of the water-ways was vastly exceeded and the track washed out in the most unaccountable way at the most unaccountable places. Except for the obstruction of the track, large areas would have been temporarily under water, but with so slight a fall to the water that no great velocity was possible, no great harm could be done. Consequently, there was no indication on the face of the country that these conditions obtained at time of great rain-fall.

This thing on a small scale takes place in many localities, as does also the reverse. If the drainage area has a nearly uniform slope, or if it slopes quickly near the culvert and more gently away from it, a very much less area of water-way will suffice for the same area than if it be spoon-shaped, for in almost every storm—in every one, in fact, which is a serious trial to a culvert—there are a few moments of maximum rain-fall when the mischief is done, if any is done.

When in addition the probable variations in maximum rain-fall and possible future changes in the condition of the surfaces are considered, we cannot but regard the proportioning of culverts to a formula as entirely futile. Even in the much simpler, because more regular and determinable, problem of proportioning the size of city sewers, many engineers claim that safety can only be assured by comparison with experience with as many similarly situated sewers as possible and then taking care not to overload the sewer after it is built; and with much reason. For culverts if we were called upon to suggest a formula, we could do no better than this: Estimate the necessary area as carefully as possible by existing evidences of maximum flow, which let $= A$. Then $^3\sqrt{8A} =$ the proper area for the culvert. In more popular language: Guess at the proper size and double it. We apprehend that this formula will give far more satisfactory and trustworthy results than that which our correspondent quotes, or any other which purports to be of general application to a problem subject to such extremely diverse conditions.—*Railroad Gazette.*

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## Municipal Engineering; Paper No. 3.*

### WASHINGTON, D. C.

(*Continued from Page* 163.

#### Water Department.

The Water Department has charge of laying the distributing mains, tapping for hand connections, setting valves and fire hydrants, the care and maintenance of public wells, the inspection of houses to prevent waste, and the making out of bills for the annual water rent, but all water rents are paid to the collector of taxes.

The inspectors employed by the Water Department for the detection of waste have the right to enter dwellings at any time and examine all water fixtures. If water is found running, suit is brought by the Water Department in the police court, and on conviction the offender is fined. This inspection is not at all popular with the people, and judging by the quantity of water consumed, does not accomplish all that could be desired. There are no meters used in connection with the water supply.

#### Water Supply.

The first attempt at water-supply other than wells, of which there are many excellent ones in the city at the present time, consisted in bringing the water from several springs, some of which are within the city limits and others just north of the boundary, in small pipes to the various public buildings and to a portion of the residences. These springs could only supply a small portion of the city at that time, and a more adequate supply was long ago provided; but the water for the Executive Mansion and the Capitol is still derived from these springs.

The city is supplied by gravity, the water being taken from the Potomac river at the Great Falls, and brought in a circular conduit 9 feet in diameter, eleven miles to the distributing reservoir above Georgetown, from which point is conveyed to the city in cast-iron mains. At the point where the water is taken from the river there are three channels. In the original works only the two northern ones were dammed to turn the water into the conduit. The elevation of the crest of the dam was 146.75 feet above tide at the Washington Navy Yard. The elevation of the invert of the conduit was 151 feet. The conduit was constructed either of rubble masonry or brick, laid in hydraulic cement, the material used being governed entirely by the cost at any given locality. The grade of the conduit is uniform and 0.791 feet per mile. Cabin John creek is crossed by a stone arch of 220 feet span, at an elevation of 101 feet above the water in the creek. The arch is a segment of a circle having a rise of 57.25 feet. About nine miles from the upper end the water is taken into a receiving reservoir which covers an area of about fifty-six acres; two miles further down it enters the distributing reservoir, which has an area at the flow line of forty-three acres, and a capacity of 150,850,000 gallons. The elevation of the surface is 146 feet. From this point the water is carried in cast-iron mains. Rock Creek is crossed by an arch bridge of 200 feet span, with 20 feet rise. The arched ribs are composed of two cast-iron pipes of 48 inches internal diameter, 1½ inches in thickness. These pipes convey the water and carry a roadway upon a horizontal upper chord. There is a small portion of Georgetown that is higher than the distributing reservoirs. A separate reservoir supplied by water pumped from the mains is provided for this portion. As the city increased in size the pressure on the mains was reduced to such an extent that many houses in the higher portions of the city frequently could get no water. To remedy this a pump and stand-pipe were erected, but, owing to some peculiarities in the construction, it proved of but little benefit.

The cost of the water-works for construction and maintenance from the beginning of the work, June 30, 1850, to June 30, 1885, has been $3,841,701.62.

It became evident some time ago that the supply was not sufficient to meet the demand, and in the year 1883 an extension was begun.

The plan adopted to increase the supply was to build a dam across the remaining or Virginia channel of the Potomac river at Great Falls, and to raise the height of the old dam so as to give an elevation of 148 feet above tide to the crest of the dam for the entire length, which is 2,877 feet; to construct a new reservoir north of the city near Howard University, with a capacity of 300,000,000 gallons, and connect this reservoir with the present distributing reservoir by a tunnel 20,715.8 feet in length. The elevation of the surface of the distributing reservoir is 141 feet, and the surface of the new one is to be 144.14 feet. The lowest point in the tunnel is—29.45, or 170.45 feet below the surface of the distributing reservoir. The normal section of the tunnel in rock is 7½x11 feet, giving an area of 82.5 square feet; but where it is lined the area is reduced to 76.34 square feet. From the new reservoir there will be a cast-iron main 75 inches in diameter laid for about 660 feet, where it will separate into three mains, each 48 inches in diameter. This work is now well under way, but will take nearly two years to finish.

The following extract from the Annual Report of Capt. T. W. Symons, Engineer Corps, U. S. A., Assistant Engineer in charge of the water-supply, gives the hourly consumption of water for one day, and the average daily consumption for eleven years, from 1874 to 1884 inclusive:

On the morning of the 27th of June the supply of water was shut off from the distributing reservoir for twenty-four consecutive hours, to determine the quantity of water consumed in the city of Washington. At the commencement the water stood in the reservoir at a height of 145.97 feet above reference, and at the end it was 144.21 feet; a fall during the twenty-four hours of 1.76 feet. The following table gives the fall of the water in the reservoir in decimals of a foot and the number of gallons consumed each hour:

| Date. | Fall. | Consumption per hour. |
|---|---|---|
| June 27. | | |
| | *Ft.* | *Gallons.* |
| From 6 a. m. to 7 a. m | .07 | 988,675 |
| From 7 a. m. to 8 a. m | .08 | 1,129,187 |
| From 8 a. m. to 9 a. m | .07 | 987,403 |
| From 9 a. m. to 10 a. m | .09 | 1,268,646 |
| From 10 a. m. to 11 a. m | .08 | 1,126,861 |
| From 11 a. m. to 12 m | .06 | 844,637 |
| From 12 m. to 1 p. m | .10 | 1,406,759 |
| From 1 p. m. to 2 p. m | .07 | 984,010 |
| From 2 p. m. to 3 p. m | .09 | 1,264,283 |
| From 3 p. m. to 4 p. m | .06 | 842,310 |
| From 4 p. m. to 5 p. m | .09 | 1,261,657 |
| From 5 p. m. to 6 p. m | .08 | 1,121,529 |
| From 6 p. m. to 7 p. m | .07 | 1,130,802 |
| From 7 p. m. to 8 p. m | .07 | 980,108 |
| From 8 p. m. to 9 p. m | .07 | 979,514 |
| From 9 p. m. to 10 p. m | .07 | 978,920 |
| From 10 p. m. to 11 p. m | .07 | 978,327 |
| From 11 p. m. to 12 m | .07 | 977,733 |
| From 12 m. to 1 a. m | .07 | 977,139 |
| June 28. | | |
| From 1 a. m. to 2 a. m | .07 | 976,543 |
| From 2 a. m. to 3 a. m | .06 | 836,566 |
| From 3 a. m. to 4 a. m | .06 | 836,130 |
| From 4 a. m. to 5 a. m | .06 | 835,694 |
| From 5 a. m. to 6 a. m | .08 | 1,113,580 |
| Total | 1.76 | 24,827,013 |

---

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For the past eleven years the average daily outflow of water from the distributing reservoir, measured the latter part of June, has been as follows:

| | Gallons. |
|---|---|
| 1874 | 15,554,848 |
| 1875 | 21,000,006 |
| 1876 | 24,177,797 |
| 1877 | 23'252,932 |
| 1878 | 24,885,945 |
| 1879 | 25,947,642 |
| 1880 | 25,740,136 |
| 1881 | 26,525,991 |
| 1882 | 29,727,864 |
| 1883 | 24,314,715 |
| 1884 | 24,827,013 |

This gives an average daily consumption per capita of 132 gallons for the year 1884. The following table gives the number of lineal feet and percentage of each size of pipe laid.

| Diameter in inches. | Lin feet. | Per cent. |
|---|---|---|
| 75 | 662 | 2.07 |
| 48 | 6848 | 0.81 |
| 36 | 16790 | 1.98 |
| 30 | 21985 | 2.60 |
| 20 | 10280 | 1.21 |
| 12 | 68030 | 8.01 |
| 10 | 5525 | 0.65 |
| 8 | 5925 | 0.70 |
| 6 | 603265 | 71.20 |
| 4 | 108030 | 12.75 |
| Total. | 847,340 | 100.00 |

*Specifications for cast-iron Water Pipe, Water Supply of Washington, D. C.*

3. Every pipe shall have cast upon it in letters from two (2) to two and one-half (2½) inches long and one-eight (⅛) inch relief the initials of the maker's name, the year in which it is cast, and number, in regular series, in point of time of its casting, thus: A, B, C, 1883——1; A, B, C, 1883——2, etc. Each size of pipe to have its own series of numbering. Special castings shall have similarly the maker's initials, year of casting, and serial number.

4. Straight pipe must be made of such length as to lay at least twelve (12) feet in each section; they shall be made with hub and spigot joint, which, together with all branches and special castings, shall accurately conform in shape and dimensions to the drawings furnished by the Engineer Commissioner and his instructions from time to time. No pipes or castings will be accepted which are defective in joint room from any cause. Lugs shall be cast on any or all connections and special castings, as may be ordered by the Engineer Commissioner. No pipes will be received that are more than the permitted deviation below the specified weights. For any excess above the deviation allowed no payment will be made.

5. The metal shall be such as to afford the best quality of cast-iron pipe—strong, tough, and of sound, even grain, and such as will satisfactorily admit of cutting and drilling.

6. All pipes shall be cast vertically, with the hub end down. They shall be free from all defects and imperfections. They shall be truly cylindrical in the bore, with the inner and outer surfaces concentric; straight in the axis for straight pipe and true to the required curvature or form in the axis of the other pipes, and shall be internally and externally of the full specified dimensions.

7. The pipes and castings shall be carefully cleaned, without the use of acids or liquids, and then subjected to a careful hammer inspection; they shall then be thoroughly coated, while at a temperature of 300° F., with a preparation of coal pitch varnish, which shall be of such character as shall make a smooth coating, tough and tenacious when cold, and not brittle or with a tendency to scale off.

8. Each pipe or casting shall remain in the bath at least thirty (30) minutes, and until the pipe or casting and pitch have an entirely equal temperature of the degree ordered by the Engineer Commissioner.

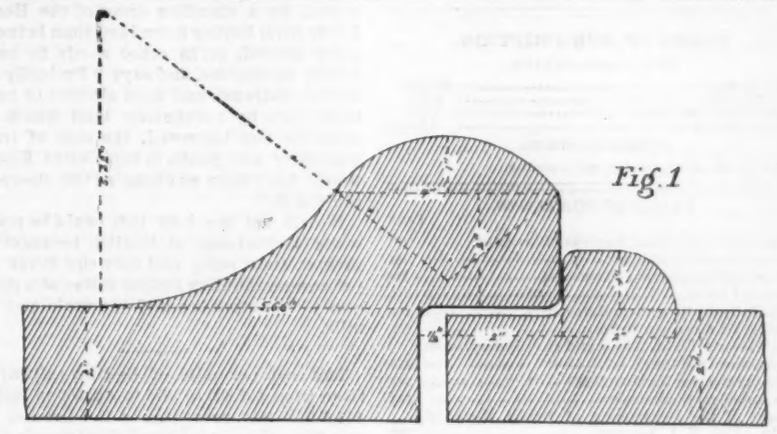
9. After being carefully drained of surplus pitch, they shall, in the presence of an inspector, to be appointed by the Engineer Commissioner, be subjected to a hydraulic pressure of three hundred (300) pounds per square inch, and to a hammer inspection while under this pressure; and, if the Engineer Commission so determine, they shall be further subjected to a similar test after their delivery and before their final acceptance.

10. The pipes and castings shall be weighed for payment after the application of the coal pitch, and the weight shall be painted conspicuously in white on the outside. If the Engineer Commissioner shall so decide, the pipes and castings shall be weighed after delivery in Washington, and the weights so ascertained shall be used in the final settlement of the contract.

*Weight and Dimensions of Cast-Iron Water-Pipes, Washington, D. C., Water Supply.*

| DIAM. | DIMENSIONS IN INCHES. | | | | | | | | | | | | | | | | | | Total Length. | | Total Weight of Pipes. | Weight per Lineal Foot. | Lead per Joint lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Inches | *a* | *b* | *q* | *b* | *c* | *c* | *d* | *d* | *h* | *e* | *e* | *g* | *e* | *f* | *p* | *k* | *l* | *k* | *m* | *m* | *n* | *h* | *o* | *q* | *j* | Feet | Inch. | | | |
| 4 | 7/16 | 3.00 | | 1/16 | 1¼ | 1¼ | 1 | 1⅛ | | ¼ | 5/16 | | ¾ | 5/16 | ¼ | 5/16 | | ¾ | ¾ | | ¾ | 2 | | | 12 | 3 | 242 | 20 | 4½ |
| 6 | 0.48 | 3.00 | | 0.40 | 1⅝ | 1⅝ | | 1⅝ | | ⅜ | 7/16 | | ⅞ | 7/16 | ⅜ | 7/16 | | ⅞ | ⅞ | | 1 | 2 | | | 12 | 3 | 395 | 32 | 6¼ |
| 8 | 0.55 | 3.00 | | 0.40 | 1¾ | 1¾ | | 1¾ | | ⅜ | 7/16 | | ⅞ | 7/16 | ⅜ | 7/16 | | ⅞ | ⅞ | | 1¼ | 2¼ | | | 12 | 3 | 600 | 47 | 9 |
| 10 | 0.62 | 3.00 | | 0.50 | 1⅞ | 1⅞ | | 1⅞ | | ⅜ | 7/16 | | ⅞ | 7/16 | ⅜ | 7/16 | | ⅞ | ⅞ | | 1⅜ | 2⅜ | | | 12 | 3 | 840 | 63 | 12 |
| 12 | 0.67 | 3¼ | | 0.50 | 2 | 2 | | 1⅞ | | ½ | 9/16 | | 1 | 9/16 | ½ | 9/16 | | 1 | 1 | | 1⅜ | 2⅜ | | | 12 | 3¼ | 1048 | 85 | 14 |
| 20 | 7/8 | 3½ | | 0.50 | 2½ | 2½ | | 1⅞ | | ½ | 9/16 | | 1 | 9/16 | ½ | 9/16 | | 1 | 1 | | 1⅜ | 2⅜ | | | 12 | 3½ | 2168 | 181 | 35 |
| 30 | 1⅛ | 4 | | 0.50 | 2⅞ | 2⅞ | | 1⅞ | | ½ | 9/16 | | 1 | 9/16 | ½ | 9/16 | | 1 | 1 | | 1⅜ | 2⅜ | | | 12 | 4 | 4195 | 350 | 56 |
| 36 | 1⅜ | 4¼ | | 0.50 | 2¾ | 2 | | 1¾ | | ⅝ | 11/16 | | 1⅛ | 11/16 | ⅝ | 11/16 | | 1⅛ | 1⅛ | | 1⅝ | 2⅝ | | | 12 | 4½ | 5741 | 478 | 80 |
| 48 | 1.50 | 4.75 | | 0.50 | 3 | 2¼ | | 1¾ | | ¾ | 13/16 | | 1¼ | 13/16 | ¾ | 13/16 | | 1⅜ | 1⅜ | | 2⅛ | 4 | | | 12 | 4¾ | 9560 | 775 | 111 |
| 75 | * | | | | | | | | | | | | | | | | | | | | | | | | | | | 19179 | 1575 | |

*See Plate 12, Fig. 1.



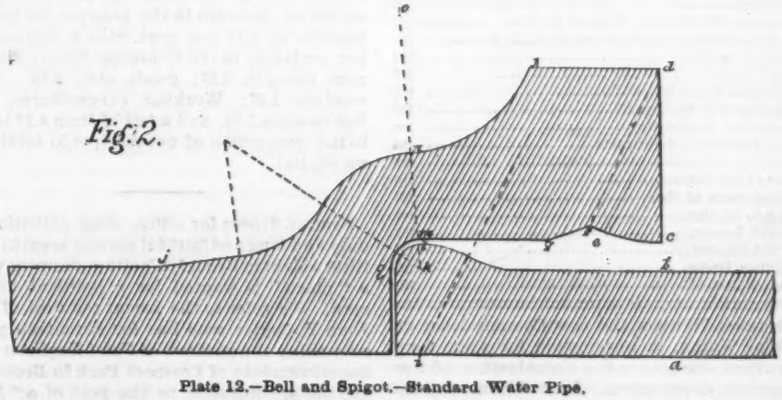




Plate 12.—Bell and Spigot.—Standard Water Pipe.

The ton used shall be the gross ton of twenty-two hundred and forty (2240) pounds.

11. All tools, materials, men, and expenses necessary for the proper manufacture, inspection, and weighing in the shops, and for the delivery of the pipes and castings, as hereinbefore required, shall be furnished by and at the cost of the contractor, not including, however, the salary of the inspector appointed by the Engineer Commissioner, for any part of the period covered by the contract; but if the services of this inspector should be required for a longer period, because of default on the part of the contractor, his salary for such additional time will be deducted from any amount that may be or become due said contractor.

12. The whole process of the manufacture of the pipes and castings shall be opened at all times to the inspection of the Engineer Commissioner. Specimen castings of the metals used, suitable for a testing machine, shall be made when desired by him, and such castings must bear a tensile strain of sixteen thousand (16,000) pounds per square inch. He shall have power to prevent the use of any metal, mould, or core, which, in his opinion, may not be proper for the purpose for which it is intended; he shall inspect and approve or reject the process of cleaning and testing the pipes, the preparation and application of the pitch varnish, and, in general, the form, size, uniformity, and condition of all pipes. On all these questions the decision of the Engineer Commissioner shall be final, and he may further reject, without proving, any casting which is not in conformity with the specifications and drawings furnished.

13. All pipes and castings contracted for must be finally found in all respects sound and conformable to the foregoing requirements. The several inspections will not relieve the contractor of any of his obligations in this respect, and any defective pipes or other castings which may have passed inspection at the foundry or elsewhere, will be at all times liable to rejection when discovered, until the final adjustment and completion of the contract.

14. Payments will be made on or before the tenth day of each month for all pipes and castings received and accepted in proper order and condition and in accordance with these specifications during the previous calender month, less twenty (20) per cent. of the amount found due, to be reserved until the satisfactory completion of the contrac .

15. To prevent disputes and litigations it is expressly understood that the decisions of the Engineer Commissioner shall be final as to the acceptance or rejection of any pipe or casting delivered, and that he shall decide as to the meaning and intent of these specifications, or any obscurity in the wording of them; and, further, that he shall have the right to correct any errors or omissions in them necessary for the proper fulfillment of their intention; the action of such correction to date from the time that the Engineer Commissioner gives due notice thereof.

16. The prices bid must cover the entire cost to the District of Columbia for the pipes and castings finally accepted under the provisions of these specifications; and for any extra work or change due to any alteration or correction in said specifications, the fair price to be paid shall be determined by the Engineer Commissioner, and stated in writing by him at the time such extra work or change is ordered, otherwise no claim for any payment above the regular contract price will be allowed, nor will any claim for extra work be admitted if such work shall have been done without a written order from the Engineer Commissioner antedating the execution of the same.

17. Whenever the words Engineer Commissioner are used, they refer as well to his authorized agents limited to the particular duties entrusted to them in writing.

(TO BE CONTINUED.)

# ENGINEERING NEWS

AND

AMERICAN CONTRACT JOURNAL.

TRIBUNE BUILDING, - NEW YORK CITY.

THE ENGINEERING NEWS PUBLISHING CO. PROPRIETOR.

VOL. XVI. Saturday, September 18, 1886.

CONDUCTED BY

GEO. H. FROST, - - - Assoc. Am. Soc. C. E.

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GENERAL NEWTON, the new Commissioner of Public Works, is responsible for some very important changes in the organization of the Aqueduct Commission. Last Wednesday he introduced a resolution which reduced the number of members in committees in such manner that the Commission and not special committees shall hold the balance of power.

Another resolution created the office of an Assistant Chief Engineer; Gen. Newton giving as his reasons, that he was convinced that there should be such an officer to lighten the work of the present Chief Engineer and to act in his absence or in case of illness or death.

A Secretary to the Land Committee was also proposed; and it is generally understood that this position will begiven to Mr. McCulloh, both in recognition of his eminent fitness for the office and in a degree to compensate him for his unjust removal from office by the late Commission. General Newton does not seem to approve of the removal of Mr. Sheehan, Mr. McCulloh's successor, on the grounds that Mr. S. has faithfully discharged his duty, is competent and it would be a second act of injustice to remove him.

General Newton has also taken vigorous steps in investigating the Fifth Avenue paving job; by first dismissing the late engineer-in-charge, Mr. McIntire Smith, who it seems has a little bill of some $70,000 against the city for his valuable services; and by next suspending work on the pavement until the late charges of Col. Geo. T. Balch and the new engineer. Mr. Coryell, can be looked into.

THE government of England have decided that the Board of Trade will not be in position to deal with questions of railway rates this session. It will be remembered that the Liberal government took up and introduced a bill that had been partly elaborated by the preceeding Tory government, but the opposition to it was so strong on the part of the railway interests that it was allowed to drop.

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*Bradstreet's*, that is generally careful of its assertions, commenting on the higher capitalization of English roads and their excessive freight charges lays these phenomenal rates to the fact that English roads are prevented by a standing order of the House of Lords from buying more land than is immediately needed, or, in other words to buy for future necessities, and says "Probably if the British railways had been allowed to recover their costs by purchasing land which their presence has improved, the cost of transit, passenger and goods, in the United Kingdom would have been as cheap as the cheapest in the world."

We do not see how this could be possible while the first cost of English locomotives is greater than ours, and they run fewer miles per annum, hauling lighter trains at a greater cost of maintenance and renewals per train mile.

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THE cost per mile of English railways has risen from £37,800 in 1875 to £42,500 in 1884 and £42,600 in 1885, according to the London *Railway News* and according to *Bradstreet's* a comparison of the results of the past two years shows as increase in the receipts for miscellaneous of 3.16 per cent. with a decrease, in per centages, in the following items: Passengers receipts, 0.85; goods, etc., 2.12. Total receipts, 1.37; Working expenditures, 1.15. Net receipts,1.61, and a fall of from 4.16 to 4.02 in the proportion of net receipts to total paid up capital.

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SPECIAL fitness for office, close attention to duty and long and faithful service seem to have little weight in Brooklyn's city goverment when a "place" is wanted for a political henchman. We refer to the recent removal of Col. John Y. Cuyler, who has for seventeen years ably filled the position of Chief Engineer and Superintendent of Prospect Park in Brooklyn, and the appointment to the post of a "Navy Yard worker," a man whose only recommendation is that he has earned recognition from his masters by very dubious work at the polls.

Col. Cuyler is not even charged with being an "offensive partisan;" he has simply attended strictly to the business for which the city paid him, and has performed his duties in an eminently satisfactory manner. His offence evidently was in attending too strictly to his business and in not working for the general advancement or profit of some ambitious politician.

When will civil engineers, those connected with our municipal works especially,be rescued from the power of men who simply regard their responsible positions as "a place to be filled?" The man who is best fitted,in the eyes of these masters, is not he who can fill the office best by reason of strict integrity, long training and general knowledge, but it is the ward manipulator, who will use his power only for the benefit of those appointing him, and will be conveniently blind to unwarranted expenditures that will benefit any body—except the payer of taxes. Is it to be wondered at that the press of the country is daily filled with scandalous disclosures of all manner of crookedness connected with our public works; that public money is wasted on "jobs," and that the so-called engineering work is often badly done?

A high sense of honor and a strictly impartial judgment in all things submitted to him are the keystones of the reputation of an engineer proper. The demands of his profession leave him no time to dally with politics; and the weak man who attempts to strengthen his professional position by so doing will, sooner or later find himself smirched with the filth inherent to modern city mismanagement. An engineer is human, and under the pressure of circumstances may sometimes fall from his high estate; but it is to the honor of the profession that such cases are very rare, and when an obedient or corrupt tool is wanted the politician must go outside of the ranks, as in the case first quoted. And in this Brooklyn example, the managers of the Park Commission had even to go as far as Kew to fill the position next to that of Col. Culyer.

We cannot ourselves answer the conundrum as to when this order of things will be changed; but we believe it is only fair to engineers to call attention to the fact that they are not, as a class, responsible for the bad character of much of our public work—as the people too often believe. Even when the engineer is thoroughly capable, and himself an honest man, he is too frequently so entangled in the political mesh laid about him that he is not the master of his own movements, and is practically powerless to prevent misdoings. In many other cases the so-called engineer is not an engineer at all, but has just a sufficient knowledge of his duties to form a thin but serviceable cloak to cover his evil practices; practices which may be charged both to ignorance of his business and to a burning desire to put money in his own purse and the pockets of his masters.

But the good public who make the masters make the servants as well, and they must pay if these masters and servants simply regard a strictly professional position as "a place," and the public money as "spoils." Under our republican form of government the remedy lies with the tax-payers. But when will they see fit to use it, by maintaining *only* good men in office?

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### Freight Train Weights and Speeds.

In the discussion on Gordon's "Economical Construction of Railways, by the Institution of Civil Engineers, noticed in ENGINEERING NEWS of July 31st, it was asserted that our freight cars were not safe with the loads for which they were rated, except over level lines and at very slow speeds.

The following figures kindly communicated by Mr. S.H. Church, Superintendent of Transportation P. C. & St. L. and C. St. L. & P. railroads, show the regular practice on those roads between Chicago and Pittsburg and Indianapolis and Pittsburg:

Dressed beef refrigerator train, Chicago to Pittsburg, daily average 18 cars.

| | Pounds. |
|---|---|
| Average weight of empty cars | 36,605 |
| " " " loading | 21,250 |
| " " " loaded car | 57,855 |
| Total weight of 18 cars | 1,041,390 |
| Total weight of engine and tender | 149,350 |
| " " " train | 1,190,740 |

Regular schedule run Chicago to Pittsburg, 507 miles, 34 hours, 35 minutes.

| | |
|---|---|
| Average speed per hour | 14.5 miles. |
| Fastest speed when leaving Chicago late, per hour | 26.2 " |

The special beef train, when run irregularly, makes the time between the above points in 26 hours 12 minutes, or at the average speed of 18.8 miles per hour.

Stock train, Indianapolis to Pittsburg, daily average, 30 cars.

| | Pounds. |
|---|---|
| Average weight of cars empty | 24,475 |
| " " " loading | 26,000 |
| " " " loaded car | 50,475 |
| Total weight of 30 cars | 1,514,250 |
| Total weight of engine | 149,350 |
| " " " train | 1,663,600 |

Regular schedule, run Indianapolis to Pittsburg, 381 miles, 26 hours, 30 minutes.

| | |
|---|---|
| Average speed per hour | 14.4 miles. |
| Fastest speed when leaving Indianapolis late | 21 " |

All these trains go through to New York, 439 additional miles, without breaking bulk.

In accomplishing this, the trains pass over ascending grades of 63⅛ feet per mile and descending grades of 100 feet.

### English *vs.* American Rails.

The comparatively late purchase of 10,000 tons of English steel rails by the Chicago, Burlington & Quincy R. R. Co., has been used as an argument against the general merits of the American product, because this railroad company was willing to pay "six guineas a ton more for the English article."

At least that is the way the English press generally stated it at the time, and many of the American papers cried out in consequence about the "decline in quality" of American steel rails. But among the evidence just submitted before the British Commission on Trade Depression, there is some testimony particularly interesting on this head which puts the "famous rail transaction" in quite a different light.

The Chicago rails were bought from the Barrow Hematite Company, of England; and now Mr. J. T. Smith, of these works, testifies in substance that while his company nominally received £2 10s. over the American price of rails, the English firm actually paid the duty of $17 per ton before landing them in New York. That is, the exporter and not the importer, settled the bill with the American custom house. This rather peculiar reversal of the order of things made all the difference in the world in the transaction so often quoted; and though the Englishmen did not feel called upon to advertise this "strictly private" stroke of business, they really *undersold* the American market to the extent of about $5.30 per ton at tide-water. So that after all it was not a question of the quality of the rail, but simply a shrewd but unmerciful bit of bargaining on the part of a Yankee railroad corporation which was taking a wicked advantage of the depression of British trade. The fact that the same railroad company has since placed an order for 20,000 tons of rails with an American maker would seem to prove that the American maker can compete even with the most desperate trade tactics of the British manufacturers.

### The Electric Light Wires and the Underground System in Chicago.

Prof. J. P. Barrett, Superintendent of Fire-Alarms for Chicago, read before the Annual Convention of Fire Engineers, at Providence, R. I., on Aug. 24, a paper detailing present experience with underground wires in Chicago. We make the following abstract:—

After pointing out at some length the danger to be apprehended from over-head electric light wires, Prof. Barrett gives his reasons for putting these and all other wires, fire and police wires especially, underground, and then describes the system now existing in Chicago.

He is firmly convinced that the place for the wires is underground, and it is now only a question of first cost for so doing, and to July 1, 1886, the city of Chicago and the companies interested have taken down 608 poles and removed 917 miles of aerial wires. The new system was inaugurated there about 1876, and the first underground wire laid in 1877. The trial was first made with 840 feet of iron pipe, treated inside and out with Stockholm tar, and through this two Kerite wires were pulled. This attempt was sufficiently successful to force the passage of a law in 1881, to take effect in 1883, compelling all parties owning wires to place them underground within the corporate limits of Chicago.

Several underground systems have been adopted; iron pipes and wooden boxes filled, some with asphaltum, others with cement, etc. Prof. Barrett says that perhaps the Dorsett system is the most complete yet used. This system was described in our last issue, and consists essentially of an asphalt concrete conduit pierced with any desired number of ducts and provided with manholes and hand-holes for the manipulation of the wires. In Chicago, the Sectional Underground Company controls 17 miles of conduit and 150 miles of wires outside of those belonging to the city, and including all electric-light wires; the Western Union Telegraph Co. has 10 miles of conduit and 200 miles of wires; the Chicago Telephone Co. has 3 miles of conduit and 700 miles of wires; the Bankers' and Merchants' Telegraph Co., 15 miles of conduit and 400 miles of wires; the Postal Telegraph Co., 4½ miles of conduit and 100 miles of wires and the B. & O. Telegraph Co. controls one-half mile of conduit and 50 miles of wire.

The Chicago Municipal System, exclusive of the city electric-light wires, consists of 63½ miles of single wires laid through 7,931 feet of conduit built and owned by the city; 20 miles of single wires laid in 4 miles of conduit owned by the Sectional Co.; 10 miles of single wires under sidewalks in the central part of the city; 1,955 feet of wire in 840 feet of iron pipe and about 1½ miles of cables under the rivers. The single wires are No. 13, copper wire, B. & S. gauge, Kerite insulation, wrapped with tape.

The conduit owned by the city is a 9-inch concrete pipe with manholes, 44 inches in diameter and 5 feet deep. In the various branches from 20 to 40 wires lead to lightning-arresters at each end, and from these points the air-lines diverge. These wires have been in service since August, 1884, without giving trouble.

The wires in the Sectional Co.'s conduit are wholly underground and cover an area of nearly a square mile, and to them are connected all the municipal telegraph and telephone apparatus in that part of the city bounded by the river on the north and west, by Van Buren Street on the south and Lake Michigan on the east. There are in all, 42 street fire-alarm boxes, 23 police-alarm stations, 79 private police and fire-alarm boxes, and 12 other boxes, including 8 newspaper offices.

Where the side walks have been utilized the space underneath has been excavated and covered with stone, and the spare room used for a variety of purposes such as barber shops, laundries, saloons, coal-bins, etc. While the city presumed that it had a legal right to this area, the fact that the entrance to it lay through the store or office of the abuttor made it necessary to obtain their consent. This was very generally freely granted as compensation for the removal of the unsightly poles and obstructing wires.

The properties are divided by partition walls varying from 6 to 36 inches; through these walls 1¼ inch pipe is passed with a short piece of larger diameter pipe at the joints instead of the usual coupling; this piece can be slipped back so as to get at the wires for testing, etc. When the space is clear and dry the insulated wire without covering is put well up out of the way. In crossing alleys extra strong pipe was driven across, a steel point being attached to one end and a drive-head at the other. The fire-alarm boxes are fastened to the lamp-posts and the wires are brought up through the posts through bent pipe. In regard to the durability of the iron pipe, the wires so placed in 1877 are doing as good service as ever, and no ground cross or break has ever occurred.

### Cleaning Greasy Tracing Cloth.

Mr. John L. Cully, Civil and Mechanical Engineer, of Cleveland, Ohio, sends us a communication relating to the treatment of tracing cloth so as to remove the greasy spots and supply a good surface for the application of india-ink lines. He says he has used the following in his own practice for several years and finds it very satisfactory:

Take any clean waste paper, an old newspaper for example, and after crumpling it in the hands, rub the entire surface of the cloth with it; the paper works best when crumpled up, and the cloth should not be rubbed too hard.

We would add to the above another method of arriving at the same end, and one that we have seen used for years with the best results. Rub the stretched cloth gently with what is called "marble dust," to be obtained at any marble sawing yard, and brush off all loose dust with a soft cloth. Another and quite as good substance is ordinary "face powder;" such as comes in cakes, and is best applied to the tracing cloth by hand. Powdered magnesia will also work well, as the principle is the same in all of using a material that will absorb grease and at the same time *slightly* reduce the excessive polish of the surface of the cloth.

As every draughtsman is interested in this subject, we would like to hear of any other well proved method of obviating the miseries of attempting to draw in ink on greasy cloth.

### The Aqueduct Commission.

The Construction Committee of the New Croton Aqueduct, on September 8, elected Commissioner O. W. Barnes as Chairman, vice Mr. Spencer, General Newton having first declined the position. This action has caused some public comment in the present strained condition of affairs; but the change is explained by some of the Commission as being solely due to the fact that Mr. Barnes is an engineer of ability, and with his wide experience his position at the head of this committee is fitting and will be for the best interest of the work. Mr. Spencer is already President of the Commission and could hardly afford the proper amount of time required by the needs of these two offices.

The Aqueduct Committee, on the same date, granted permission to Contractors Clark & O'Brien to sink a shaft between shafts Nos. 16 and 17, at a cost not to exceed $5,000. The important question of better light and ventilation in the tunnel was then taken up; and having first ascertained that they had authority in the matter, the Commission ordered the Chief Engineer to advertise for electric lights and ventilation at all points not so provided by the contractors. Though not so stated, the cost of such work is, presumedly to be deducted from contractors estimates. According to the delinquent report this action will not effect the contracts of Clark & O'Brien, as their work is reported in good condition.

THE publishers of Poor's Manual of Railroads and Poor's Directory of Railway Officials are sending out circulars requesting information as to the officers, physical characteristics and equipment of all the railroads of the country.

### Report of the Department of Public Works of Brooklyn, N. Y., for 1885.

From the annual report of the Department of Public Works of the city of Brooklyn, N. Y., to February 1, 1886, we make the following abstract:

The total revenue of the department for 1885 was $1,288,668.04, a net increase in revenue proper over 1884 of $81,389.83. Of this revenue $1,257,796.46 came from the water department, but the maintenance and interest on bonds for the water-works cost $1,204,027.67, showing only a net surplus of $53,768.69 on account of water. Commissioner Fleeman states that an increase in water rates will be needed to meet interest on the bonds for the proposed extension of the works; he also recommends the continued and increased use of meters as the best means of preventing waste in the present state of the water supply of that city.

In broaching the subject of the extension of the works, Mr. Fleeman says that the city needs 2,084 acres of land, of which amount nearly all the land required for conduit, reservoir and pumping station, is purchased, or 422 out of 472 acres; of the ponds, streams and swamp land, 833 out of 1,612 acres is secured. The total cost of these purchases is $251,832.88, while a liberal estimate puts the cost of the remainder at $147,000, or considerably below the sum of $500,000 originally appropriated for land.

Though given before, we repeat the chief engineer's estimate for the entire contemplated work, including new pumps at Ridgewood and the enlargement of the Ridgewood reservoir, both necessary to the scheme. The amount is as follows:

| | |
|---|---|
| The 10¾ miles of aqueduct with all appliances, but excluding cost of land | $2,201,979.00 |
| Necessary alterations to old conduit | 75,000.00 |
| New engine and house at East New York | 287,000.00 |
| Enlargement of Ridgewood reservoir | 403,000.00 |
| Total | $2,966,979.00 |

The average daily water consumption for 1885 was 43,414,270 gallons, an increase of 4,535,236 gallons over 1884. The chief engineer notes that this increase is extraordinary, and means simply a greater waste of water rather than an increase in population. The average daily consumption for the summer months of 1885 was 44,928,224, while for the same period in 1884, it was only 37,846,859 gallons. At this rate the required supply for 1895, would be 115,000,000 gallons daily. The winter waste is evidently enormous, though the works are in a better condition then to supply water; in February, 1885, the daily consumption ran up to nearly 49,000,000, and on the 11th of that month to 50,0000,000 gallons. This loss is charged directly to the habit of letting water run freely to prevent house-pipes from freezing. This is a strong argument in favor of compelling all builders, of new houses especially, to place the water-pipes out of the reach of frost. The chief engineer says that the new works have been already too long delayed, and that the city is now "trusting to Providence and a wet season" until a new supply can be obtained.

The description of the proposed extension of the works and the approving report of the experts, Messrs. Adams, Worthen and Fteley, have already been given in this journal. We might only add that Chief Engineer Van Buren puts the present safe supply at 45,000,000 gallons per day, and to secure this the pumping engines must be run over their constructed rating; while as was shown the daily consumption greatly exceeds this at times. The average yearly increase in the past ten years was about 1,500,000 gallons, but the increase of 1885 over 1883 was 2,500,000 gallons, due in part to an increased population and in part to a better head secured by laying new 36-inch mains. He estimates the future yearly increase at not less than 2,000,000 gallons per day.

An interesting part of the report is devoted to a description of the Knickerbocker avenue sewer extension. This main sewer provides a drainage outlet for about 2,800 acres of low land, and the general section is a circle 12 feet in diameter or its equivalent area, where conditions required it to be flattened. A very considerable portion of this sewer was constructed in tunnel through sand and gravel and in a street lined with buildings. The ingenious method by which this work was accomplished by the contractors, Mr. Charles Hart and Messrs. Anderson & Barr, was fully described in ENGINEERING NEWS last May. On the open cut portions of this same sewer, the excavation and refilling was accomplished by the machinery of Mr. H. A. Carson, a process described by the engineer in his report as the "neatest and most expeditious for sewer work" under the existing conditions of a narrow house-lined street and a deep trench. The greatest monthly progress made in the building of this 12-foot brick sewer was 393 feet on the tunnel section, and 850 feet on the open cut. The report contains illustrations of the methods pursued and the cross-sections of the sewer at various points, together with profiles showing material penetrated and the monthly progress made.

From the report of Water Purveyor Peter Milne, Jr., we find that the daily consumption of water per capita during 1885 was 66.45 gallons, with an estimated population of 653,414. This was an increase of 5.22 gallons per head over the consumption of 1884. The average daily consumption of water measured by meters was 5,701,936 gallons. Over 4,000 leaks in house service were reported and repaired, and the inspectors of plumbing visited 17,223 houses. The total number of taps in use to January 1, 1886, was 72,402.

### Redeemed Lands.

The process of redeeming land in the United States is going on at rate little dreamed of by the general public, and territory purchased at twelve and one-half cents per acre is being turned into very productive property.

The Florida Land Improvement Co., has, through Philadelphia capitalists, secured 4,000,000 acres in that State, and by a system of canals is rapidly draining this vast area. The Okeechobee Drainage Co., of the same State, has 8,000,000 acres, including a large part of the Everglades. Since 1881 this company has by a canal lowered the level of Lake Okeechobee several feet and so redeemed many thousand acres. The company has expended $1,200,000 in drainage work and by so doing has gained 1,255,432 acres of fast land, selling for from $1.25 to $5.00 per acre.

In Louisiana, the Watkins and the Louisiana Land Reclamation companies are the chief workers. The former owns 1,250,000 acres on the Gulf coast, with 120 miles of water front on the Gulf; this company has expended $275,000 and expects to spend in all about $7,500,000 in reclaiming these lands, which ten years ago were unexplored.

### PERSONAL

MR. DEVILLE, Surveyor-General, has gone to British Columbia to examine into the progress of surveys there and hold an examination in connection with the Dominion Board of Local Surveyors. Mr. King will act as Surveyor-General during his absence.

CAREFUL attention will be given to draughting at Rutgers College, this year. Prof. A. A. Titsworth, M. S. C. E., an alumnus of Rutgers, and recently Professor of this subject, at Alfred University, has been elected Professor of Graphics and Mathematics, and will assume the duties of his chair on the 22d of this month.

THOMAS STEVENS, the bicyclist who is riding around the world, has had to put up with some bad roads since he started; but now he has come to Lahore and starts on the greatest macadamized road in the world. The road is 1,800 miles long; Stevens will use of it 1,350 miles.

INDICATIONS point to as large, if not a larger, freshman class at the Rensselaer Polytechnic Institute at the opening of the fall term last Wednesday than a year ago. The only change in the faculty will be a successor, not yet decided upon, to Frank P. Whitman, A. M., professor of physics, who has resigned.

ENGINEERS FOR THE NEW MARKET STREET BRIDGE, PHILADELPHIA.—FREDERICK J. AMWEG, has just been appointed by Chief Engineer Smedley as an Assistant Engineer, at $125 per month, in charge of the new bridge. At the same time, JOHN A. WILSON and J. H. LINVILLE were appointed consulting engineers to examine and report upon the pier foundations of the old and new bridge.

The copartnership formerly existing between J. HERBERT SHEDD and EDWARD SAWYER having been dissolved by mutual consent, each partner will settle and be solely responsible for all of the business heretofore managed by him, and each will continue in the business of engineering, on his own account, at 60 Congress street, Boston, and 65 Westminster street, Providence.

THE Harpers will undertake a novel enterprise next month. They will have a special car fitted up and send three artists and two good writers through the south. The car will be equipped for work and for living in. The main points visited will be Asheville, Atlanta, Birmingham and Nashville. This enterprise by the Harpers is the result of a suggestion from Mr. J. H. Inman. The work will be done mainly for the magazine, and will be the most elaborate studies of Southern affairs undertaken for several years.

CASE SCHOOL OF APPLIED SCIENCE.—The great stone building out on Euclid avenue, Cleveland, is ready to receive the pupils, and a prosperous term is promised. Applicants for admission are examined in arithmetic, algebra, geometry, English grammar, and the elements of physics and chemistry. The faculty this year will consist of the following gentlemen: Cady Staley, Ph. D., president; John N. Stockwell, Ph. D., professor of astronomy, and Kerr, professor of mathematics; Albert A. Michelson, Ph. D., professor of physics; C. Vaillant, B. A., professor of French; John Eisenmann, C. E., professor of civil engineering and drawing; Charles F. Maberly, S. D., professor of chemistry; James Ritchie, B. S., instructor in civil engineering and mathematics; Hudson A. Wood, A. M., instructor in English and modern languages.

THE coast-survey parties are now in the field busily engaged in pushing the work forward. Two topographic parties and one hydrographic party are already at work on the resurvey of San Francisco bay. Owing to the very limited appropriation for the Alaska work (only $4,000 being appropriated in lieu of $9,000 asked for), the steamers especially employed for this work at an expense of several thousand dollars are to be immediately called from the field, there being no money to carry forward the necessary work for which an admirable plant had been provided. Professor Davidson had returned from Portland, Oregon, where he was engaged in astronomic and magnetic work, to San Francisco, and has resumed his duties in charge of several parties on the Pacific coast. The parties on the transcontinental arc are all at work except Assistant Eimbeck, who would be in the field were it not for the lateness of the season, which is inopportune for locating stations on the summit of the Rocky mountains. The telegraphic longitude parties are at Salt Lake and Ogden. Sub-assistant Marr is ordered from the magnetic observatory at Los Angeles to report for duty in telegraphic longitude work at Salt Lake. The physical hydrography of Delaware bay and river has been completed as far as this year's appropriation will carry it, and Assistant Mirinden is about to transfer his party to New York bay and harbor, where the work of last summer will be continued. If progress is as rapid as it has been heretofore, the resurvey of Long Island Sound will be completed the present season. Assistant Weir will take up the topographical work in the vicinity of Chatham, Mass., in connection with Professor Mitchell's physical survey of Monomoy Shoals. Mr. F. M. Thorn, Superintendent of the coast survey, who left Washington for Orchard Park near Buffalo, N. Y., has returned to his official duties.—*Science.*

and less than $100 in money and property. He has now a fortune of several million dollars, is director in institutions that aggregate more than Vanderbilt's wealth, and has been instrumental in having brought into the South more millions than he has dollars, when he left her, bearing nothing but the knighthood that she laid with loving hands on his well-worn cap of gray.—Atlanta *Constitution*.

## CORRESPONDENCE.

### American Engineering Plant in Mexico.

GUANAJUATO, MEXICO, Sept. 2, 1886.

EDITOR ENGINEERING NEWS:

To-day a contract was entered into between the Union Iron Works, of San Francisco, Cal., represented by their agent for Mexico, Mr. W. P. Pennock, and the Concordia Mining Co., Señor Francisco Glennie, General Manager and Chief Engineer for a first class hoisting plant for the Rayos shaft.

The shaft is 30 feet in diameter, and 1320 feet deep with a normal depth of about 1,000 feet of water.

The hoist is to be used not only in unwatering the mine but in hoisting ore. The amount of water entering the shaft is estimated by Mr. Glennie at 300 gallons per minute.

The plant will consist of two direct acting Corliss engines, with the addition of the celebrated equilibrium poppet valves, for the construction of which the Union Iron Works are so justly famed.

The engines are to have cylinders 18-inches diameter and 60-inches stroke. They will be four steel boilers, 60 H. P. each, 54-inches diameter, by 16 feet long, all connected to work independently or conjointly.

The cable will be flat steel, 4 inches wide and 1¼-inch thick.

Attached to the reels is to be a Behr indicator, showing at a glance the position of the cages in the shaft, also standing brakes and clutches.

The introduction of this plant is of great interest to American manufacturers of mining machinery, as heretofore the English have had almost a monopoly in the camp for such work, and Guanajuato is to-day not only the largest mining camp in Mexico, but in the world. The mines have been worked since 1554 and are yet far from developed. The introduction of steam machinery in the mines has been lately commenced, and the contract referred to contemplates a larger and more complete hoist than yet at work.

There are no steam pumps in the mines of the district, many of which have been abandoned for want of facilities to handle an amount of water which could easily be disposed of at small expense with steam machinery and which would guarantee rich returns to American enterprise under the liberal mining laws of the Republic. B. G.

### An Engineering Experience on the C. P. R.

DOMINION BRIDGE CO.,
LACHINE, PROVINCE OF QUEBEC, Aug. 30, 1886.

EDITOR ENGINEERING NEWS:

Early in March of 1883, Mr. James Ross undertook to build the C. P. R. from Swift Current, about five hundred miles west of Winnipeg, to Kamloops, a distance of nearly 700 miles.

Parties of locating and constructing engineers were immediately organized in Winnipeg and sent out to their duties as soon as possible.

By May of that year, wishing to have a designing office close at hand, Mr. Ross sent for Walter A. Doane, of Meadville, Pa., and located a young Scotchman and myself with him at Medicine Hat, where we staid for six weeks, dashing off plans and tracings for trestles, trusses, station house, engine houses, etc., as well as the masonry for the south Saskatchewan River Bridge and staking out several large yards. Medicine Hat that summer rivalled Pueblo as the hottest place in America. This may be better understood when it is known that this town lies in a deep hollow in the prairies and is generally destitute of a "breath of wind."

About five o'clock on the afternoon of the 2nd of July we were draughting in a large tent, the sides of which had been fastened up to try and coax a little air in, as the thermometer indicated 107 degrees Fahr. in the shade.

Suddenly a delightful breeze tickled our sweltering bodies, but as this breeze quickly grew fiercer we rushed out to fasten down the sides of the tent, finding that the pegs were torn out as soon as driven, and thinking that a storm of such fury could not last long, I thought to keep my side of the tent down by sitting on it. After twenty minutes of this novel exertion my muscles began to give out while my eyes, nose, ears and mouth were fairly choked up with dust, which was hurled about with far greater force than the snow in the severest storm, when all at once I felt myself lifted high into the air only to descend, rear-elevation foremost, on a large bunch of the prickliest cacti. Naturally I didn't waste much time in shifting my position. On regaining my feet a fight against the wind was commenced and it was no light job to force my way to the car in which we took our meals, for, not only was it necessary to keep bailing the dust out of my eyes to see my way but also to keep dodging boards which were being rent from the roof of a shed near by and playing dangerously close to my head.

By six o'clock the storm had ceased but what a havoc had been made: tents had disappeared entirely, the fragments of newly-erected sheds were scattered to the winds, while, alas! what had become of our drawings? A few were picked up a week later five miles away, but the majority were in the stationary box, the lid of which slammed shut, not, however, until a bottle of black and another of red ink had fallen in and discarded their corks.

But the most phenomenal change was that of the mercury, which in one hour fell from 107 degrees to 40 degrees Fahr. We were nearly frozen.

This is what they call a summer blizzard and may I never experience another, much less a winter one.

THOS. KENNARD THOMSON.

### False Skew Arch.

PHILADELPHIA, Sept. 13, 1886.

EDITOR ENGINEERING NEWS:

Being desirous of building an arch culvert over a stream which a line of railroad crosses at an angle of 30°, I would like to ask your opinion or that of your readers whether it would be safe to build it in the ordinary manner of a square culvert, that is making the corners parallel to the axis of the same and then making the end of the ringstones uniform to the skew mentioned above, that is to say to make the end faces of the culvert parallel to the line of the railroad for the sake of a symmetrical appearance.

S. K. EWARCH.

[We would not recommend the construction suggested with an angle of skew as sharp as 30°. Bogus skew arches have been built in this manner, to our knowledge, on an angle of about 50° and they still stand perfectly safe. But the overhanging portions at either end having no abutment proper, depend for their being upon the excellence of the cement used and moreover do not carry any weight except the embankment above. In the case of a sharp skew of 30° there would be rather *too much* dependence upon mortar—and Providence.—ED. ENG. NEWS.

### Stand Pipes.

OMAHA, NEB., August 2, 1886.

EDITOR ENGINEERING NEWS.

The article in your issue of July 24th, on "Stand Pipes," has undoubtedly received considerable attention, especially in this western country, where, as the writer has correctly remarked, large stand pipes or tanks are generally used as a means of obtaining storage and elevation of water.

The formulæ which Mr. Ward presents are certainly simple in their application, and, being simple, commend themselves to a use more or less general, providing satisfactory results are always attained.

It would seem, however, while his formulæ for plain wrought-iron stand pipe gives very good results for the thickness of iron in the upper rings of the structure, it reduces the thickness of the lower rings almost to a minimum—for instance—in a tank 20 feet in diameter and 200 feet high the thickness of iron in the first ring should be according to his formula as follows:

$$t = \frac{20 \times 200}{10{,}000} + .2 = .6 \text{ or } \tfrac{5}{8}\text{" iron (nearly):}$$

now the rending pressure against the sides of the tank, full of water, is 20,784 pounds. Equating this pressure with the resisting power of the iron, allowing an ultimate tensile strength of iron 45,000 pounds, ultimate strength of a double rivetted vertical joint .66 of that of the jointed iron and a safety factor of 3, the required thickness is shown to be as follows:

$$\frac{45{,}000 \times .66}{3} \times 2t = 20 \times 200 \times .433 \times 12 \text{ or } t = 1.96\text{"}$$

or 1⅞" (nearly.)

By the latter solution there would not appear to be an undue allowance of material for the usual and probable conditions of strain in metal and joints of the pipe, though considerably in excess of the thickness as determined by Mr. Ward's formula.

Ample resistance to excessive wind pressure is required especially in a level country, for such pressure induces severe compressive strains in the rings and shearing strains in the rivets of horizontal joints, and this provision should be made for an empty stand pipe since continual ballasting by water is by no means assured.

Investigations of the results of wind pressure would seem to indicate that there exists a ratio of diameter to height to give permanent stability to plain and exposed tanks, which point is not mentioned in the article referred to. Yours very respectfully,

W. KIERSTED, JR.

### Strains on Stand-Pipes.

CLEVELAND, O., September 7, 1886.

EDITOR ENGINEERING NEWS:

In your journal of July 24th, is an article by John F. Ward, C. E., on "Stand Pipes," which has value in that it calls attention to a better and cheaper method of designing stand-pipes where great head is desired, by building a skeleton frame of iron and putting a tank larger in diameter but shallower, on the top of it, rather than build the tank from the ground up. But there are several things mentioned that at first thought it seems should not be allowed to pass without some comment.

The intention was to give information to those who have as yet had little or no experience in proportioning the material for such works, and on this account a little more care in the statement of formulæ would have been an improvement. For instance, where Mr. Ward quotes the first and common rule for finding the thickness of the plates in decimals of an inch, a novice would not know whether a tenth, hundredth, or some other decimal part of an inch was intended; and, in fact, in the example given, the result is not given in decimals at all, but in more than a whole number.

Then the formula that he has found to work very nicely for obtaining the thickness of plates, can hardly be said to be according to good engineering practice, in the first place the constant that he adds should not be used in that way, but a minimum thickness of plates should be specified, and in the second place the formula gives decidedly too small a thickness for the plates. For shallow tanks, the error is less than with tall ones, for the two-tenths of an inch that is added, goes a great way towards thickening up a very thin plate.

There are probably not a dozen engineers in the country who would be willing to strain the iron in a structure as much per square inch as is done in the Sandusky stand-pipe, for, if it is ever filled, the strain in the bottom plates would be nearly 22,000 pounds per square inch, counting the whole section of the plate; and after deducting for rivet holes it would seem though it must touch somewhere between 25,000 30,000 pounds per square inch of the net section Probably a great many stand-pipes have been proportioned in this way or in a worse; and that fact may account in part for the failures that have occurred from time to time.

Because that at Sandusky has not yet failed, furnishes no evidence of its continued stability for the future, and if a failure should take place, it would be hard to convince those who may not know the facts that it was an act of Providence or was due to poor workmanship.

Comparatively few structures fail when new, but very many have after a time, and with even less than 25,000 or 30,000 pounds strain per square inch.

Stand-pipes, from their freedom from shocks, would probably admit of using a larger strain per square inch than most other structures, but it would seem as though it would be hardly safe to use as high a unit strain as 20,000 pounds per square inch of gross section.

* * * *

### Stand Pipes.

NEW YORK, September 15, 1886.

EDITOR ENGINEERING NEWS:

In Mr. Kiersted's letter of August 2nd, 1886, he says that it seems my formula for the thickness of iron in tanks and stand pipes $\left(\frac{h \times d}{10{,}000} + .2 = t\right)$ reduces the thickness of the lower rings almost to a minimum.

This is of course what was intended, and if he had read carefully the short account in the same article of the Sandusky stand pipe, he need not have given a supposed example of smaller dimensions. If Mr. Cook had never done anything more than to build that one work, to distinguish him as a hydraulic engineer of high ability, we could still safely look to it as a monument of practice in this line, which can hardly be ignored by any one writing on such matters.

You will notice also that my formula gives for a pipe of the size of the one at Sandusky, a thickness of .67 for the lower ring where Mr. Cook used .625 in apparent safety, so that I can claim to be in fair accord with the best practice, and on the side of safety in comparison with it.

The Board of Trade of Great Britain, and the Inspectors acting under the laws relating to steam vessels in this country are certainly bodies whose experience in boiler tests entitle them to respect, and their practice would give to a shell of boiler-iron of 20 feet diameter, double riveted longitudinally, to stand 200 feet head of water or 86.8 pounds per square inch, a thickness of

.565 inches in England, and from .459 inches, to .551 inches in this country, instead of .6 as by my formula. This represents a range of tension strain reaching nearly 23,000 pounds per square inch of the whole section of the plates and clearly shows that excessively large factors of safety are not so necessary in riveted plate work, as in some other forms of construction.

When we consider that steam boilers are well-known to be very liable to distortion under test, and that stand-pipes, from their shape, are not, and that my formula for thickness gives a heavier pipe for the same water pressure than the government rules, under which so very many boilers are safely working, I still feel confident in recommending it to my fellow-engineers as convenient and reliable.

It has done me good service in many a calculation and, notwithstanding the scruples of the Cleveland gentleman about decimals, constants and such things, it does not deserve a bad reputation, and let us hope that it—or some similar one—will be generally used to the saving of time and trouble.

JOHN F. WARD.

## A Nuisance to be Abated.

The Canadian people are slow, very slow, about some things. Year after year they will jog along under a wretched service, inwardly cursing their misfortune, but yet patiently bearing the load. But with a Canadian even there comes a time when his sturdy back is broken by the "last hair." This time it is "dirty napkins" served out with the hash and hard tack on the boats of the Richelieu and Ontario Navigation Company plying between Toronto and Montreal. Wm. Lewis, of 60 Mance street, Montreal states:

"That the napkins provided on the 'Corinthian' Wednesday, August 25th, at the breakfast table between 7 and 8 a. m., were "simply filthy," and "an English officer and his wife, who have traveled through a great part of the States and Canada, most bitterly denounced the internal economy (I might almost say the infernal economy) of the boats on this line. The vessels themselves are good, but everything else is bad (with a very big B). The sleeping accommodation is wretched: the floor of the state room this gentleman and his wife occupied was in such a filthy condition that it might advantageously have been utilized for truck farming on a small scale. The dining room was so small that people had to go in in three or four relays, after a tantalizing wait and a most undignified crush in.

When you did get to the table the food was tough and poor.

The soiled napkin business is a "true bill."

The gentleman declares that he would not take ten pounds and undertake the passage from Toronto to Montreal under similar circumstances.

It was on this same old tub "Corinthian"—now about a third of a century old, and hardly fit to be a cattle boat, let alone a passenger steamer on a great tourist route—that the visiting members of the American Society of Civil Engineers to the Montreal Convention in June, 1881, found themselves entrapped, contrary to contract with the company, and were obliged to accept the filthy and insufficient accommodations of the above named old scow. Men who were accustomed to traveling about in their special railway cars, provided for their exclusive use, were obliged to lie down on the filthy deck of this bum-boat, after having paid for a state-room; the washroom was equipped with two common iron wash-basins and scantily supplied with water in pails; the few towels would have disgraced a coal miner's camp; the closets were simply vile; the table was served with food that would starve an ostrich both in quality and quantity; the neglect and indifference of the officers of the floating pig-pen were brutal. Our opinion, published in ENGINEERING NEWS of June 25, 1881, page, 251, was a mild expression of the disgust engendered by the trip from Toronto to Montreal, and hence we are glad to add even one word that may encourage any new enterprise that will drive this filthy old monopoly from the beautiful waters it defiles.

LIVINGSTON, Tex, September 10.—The Commissioners Court of this city met to-day to award the contract for building a new jail, and gave the job to J. N. Darling, of Palestine, for the sum $8,595, work to commence at once, and the jail to be completed by December 20.

## Defaulting Contractors.

Just after the fire last fall, a large number of foreign contractors flocked to Galveston, with the view of reaping the harvest that the rebuilding of some forty odd blocks of the city would afford. They came in from all directions, and as the sequel has shown could well afford to underbid home contractors, which they did by heavy margins, and in consequence secured the lion's share of rebuilding in the burnt district. The figures of these interloping contractors were so far below those of residents, that the desire to encourage home industry was knocked into a cocked hat, as citizens intending to rebuild could not afford on a $4,000 to $6,000 residence to pay from $1,500 to $2,000 merely to encourage home industry, as the above figures represent on an average the discrepancy in the bids between foreign and home contractors. Artisans marveled at the figures at which these outside contractors could afford to take contracts, but they now marvel no longer. It is stated upon the authority of skilled workmen and architects in the city that numerous buildings have been replaced throughout the burnt district, at a cost to the owner, which was absolutely less than the cost of raw material consumed and the labor necessary to construct the building. Of course, property owners as a rule, reaped the benefit in getting houses built for less than cost. From the very nature of things somebody had to suffer, and it does not require a very thorough investigation among the sub-contractors of the city and the material, men, lumber dealers, slaters, tinners, plumbers, etc., to discover who the sufferers are, and in fact in some instances the loss falls on the unpaid day-laborer, who has been left in the lurch by defaulting contractors, who, finding nothing more to do in Galveston, have left for Charleston, or some other cities whose immediate necessities will inaugurate a building boom. There were some five or six of these foreign contracting firms that suddenly migrated to Galveston after the big fire, and have recently, quite as suddenly taken their departure, the last firm, consisting of four or five partners having left within the last few days, and in all some $10,000 or $12,000 in bills for building material have been left unpaid, distributed very generously among the various supply agents of the city and sub-contractors. Besides this some buildings have been left in an unfinished and unsatisfactory condition and the owner has no redress upon the absconding contractors.

[This is an old trick: it was played very extensively after the Chicago fire of 1871; many of the dealers in materials for house-building were great losers through these vultures.—ED. ENG. NEWS.]

## Brick Pavements for Streets.

The use of brick burned to a flint hardness for paving streets are coming into public favor. The use of wooden blocks is too expensive and besides they only furnish a smooth surface for three or four years unless kept in repair at a very considerable expense, and at best the blocks only last seven or eight years. Cobble stones are expensive and when best laid make a rough surface to drive over.

Stone pavements are very expensive and when made are no better than brick pavements if made of the best paving brick.

At Charleston, in West Virginia, a short street paved with brick has been in use for fourteen years, and at this time presents a smooth surface without any repairs worth mentioning.

At Bloomington, Ill., a street the length of one square was paved with brick 15 years ago, being constantly used up to this time without repairs, is in good condition. Within the past three or four years we learn that the city authorities have had as much as two miles of their streets brick-paved. Like improvements have been made at Decatur, Ill., Jacksonville, and other points.

The usual method of laying these pavements is as follows:

Level down the street to the exact grade desired, then cover with sand the depth of three or four inches, lay the first course of brick flat on the sand, tamping them down solidly, filling the openings with sand—spread over this a layer of sand of an inch or more in depth, on which is set a course of brick on edge, breaking joints the same as in building a wall; the interstices are filled with sand, and the surface covered over with an inch or more of sand, allowing the general travel to work it into the little openings, the sama as a brick sidewalk pavement is usually covered.

Again we say the brick need to be burned to a flint hardness. However, brick that may be rejected on account of their want of hardness for this purpose will be fit for other purposes in building or sidewalks, and occasion no loss.

Our towns and cities, if they will but give encouragement to the use of this material for the improvement of their streets will not only use (in our judgment) the best material at command the country over, but in addition they will furnish a market for a class of brick that are not readily marketable for any other purpose. There are in almost every kiln of brick burned, a few thousand that are burned to a flint hardness.

We suggest to brick manufacturers the advisability of pressing the consideration of this matter upon public attention; especially place it before our city authorities; get them to put down a square or so to test its efficiency and see to it that the material is of the best and well put down. If well done it will soon demonstrate its merit—the street will be smooth and sufficiently springy to make a fine drive-way.—*Clay Worker for August.*

THE topographical work of the geological survey is progressing in a most satisfactory manner, and the following summary is given of the results attained up to the first of August, Mr. Natter's party in Massachusetts have finished the Framingham sheet and a large portion of the work north of that place, covering, in all, eighty-five square miles; Mr. Johnson's forces in the western mountainous part of the State have completed forty-nine square miles; Mr. Bodfish's division have finished altogether two hundred and twelve square miles in Massachusetts, one-half of which was partly done last year; of the region around the District of Columbia, thirty-five square miles have been completed; Mr. Griswold has a very large party at work in northern Virginia, who have completed seven hundred square miles; the central division, under Mr. Renshaw, is getting under way; Mr. Davis is at work in Central Arizona, and has completed eight hundred square miles; Mr. Wilson is at work in the gold region around Oreville, in the gold belt, with two topographical parties and one triangulation party; the topographical work covers three hundred and seventy-seven square miles, but both parties were retarded somewhat by bad weather. Up to August 27th fifty-three sheets of the general topography atlas of the United States have been published; there are forty-eight sheets in proof.—*Science.*

## WATER

THE Cleveland Herald of the 13th, published in full an ordinance prescibing the manner in which plumbing and house drainage shall be done in that city.

CEMENT LINED PIPE.—The Wakefield, Mass., Water Company is to erect a building 60x50 for the manufacture of cement-lined pipe for extensions. There are 385 water takers in Wakefield and about the same number in Stoneham.

AT a meeting of the St. Paul, Minn., water board held last week, contracts for furnishing 15 tons of lead pipe and fifteen tons of pig lead were awarded to H. B. Rugg and Rogers, Willis & Co. The lead pipe was furnished for $5 65 per cwt. and the pig lead for $4.72.

THE Abendroth & Root Co. have in course of construction and erection at the present time, their new "C" boiler, as follows: Denison Water-works, Denison, Texas, 200 H. P.; Peabody Hotel, Memphis, Tenn., 80 H. P.; Hackettstown Collegiate Institute, Hackettstown, N. J., 90 H. P.; Thomas Terry & Co., Cienfuegos, Cuba (2d order), 471 H. P.; Amatz La Guardia, Havana, Cuba, (2d order), 308 H. P.; Pioneer Iron Works for Cuba (3d order), 310 H. P.; American Dairy Salt Co., Syracuse, N. Y., 155 H. P.; Sweet Mfg. Co., Syracuse, N. Y. (2d order), 200 H. P.; Duncan Salt Co., Silver Springs, N. Y., 200 H. P.; Lackawanna Salt Co., Mt. Morris, N. Y., 138 H. P.; Edison Electric Light Co., Cincinnati, Ohio, 200 H. P.; Union Steel Screw Co., Cleveland, Ohio, 175 H. P.

ARTESIAN WELLS AND IRRIGATION.—Much ingenuity is being shown in the southern counties of California, in devising means of irrigation. Work has just begun this week on a storage reservoir near San Jacinto, in San Diego county, which is to cost $300,000 and will irrigate several thousand acres of rich valley land. Similar reservoirs are to be built near San Diego City, in Pomona, a thriving colony of Los Angeles county. The system of storing the waters of mountain streams which now run to waste in the winter and in the spring will aid in solving the vexed problem of irrigation in Southern California.

DRAINAGE.—Various towns in Kankakee Co., Ill., have petitioned for a special drainage district.

ROUNDLAKE, N. Y.—Water works and sewerage are to be introduced. Preparations are in progress. Engineers from Schenectady are engaged.

GARDEN CITY, KAN.—The Common Council have adopted the $30,000 water works report made by County Surveyor, J. S. Humphrey, resident engineer and J. W. Nier, consulting engineer of Kansas City. It will be a pipe, pump and tower system and arranged to meet future enlargement.

TEMPLE, TEX.—The annual meeting of Water works company was held on the 8th. The secretary's report shows a net earning of $38 per cent. to September 1, 1886. The water works is considered one of the most substantial enterprises. Some of the stock recently sold for $102.

NASHVILLE, TENN.—After nearly a score of years of discussion and surveying and reporting, a site for a reservoir for the new water works of Nashville, has been adopted. Kirkpatrick's Hill is to be the site; the proposed reservoir is estimated to cost $362,375. It is probable that work will be commenced as soon as possible.

FARMINGTON, ME.—C. W. Keyes, F. H. Russell, J. J. Linscott, P. W. Hubbard and D. W. Austin, all of Farmington Me., have formed themselves into a company for the purpose of supplying this and West Farmington village with water, and will petition the legislature for incorporation.

NATURAL GAS IN TOLEDO, O.—Mayor Forbes has signed two ordinances granting two natural gas companies permission to lay pipes in the city. One of these, the Standard Oil Company, promises to have gas there by January 1. There is great excitement in real estate circles over the action of the city, and property of all kinds is booming.

A SUIT FOR DAMAGE has been begun by A. T. Gallagher against the city of San Jose for $20,000 damages, sustained by reason of the pollution of the water of the Guadulupe creek and the atmosphere near his house, by the inflow of sewage from the open sewer ditch.

RESERVOIRS.—The Camden & Rockland, Me, Water Company, have begun work on their reservoir on Juniper hill. The reservoir is to be of about 5,000,000 gallons capacity and will be paved with granite blocks. The walls will be of clay, gravelled and walled up inside with granite. They will be 16 feet high. Over $8,000 has already been spent in excavating.

PLAINFIELD, N. J.,—This pretty suburb of New York has made two or three unsuccessful efforts to have a public water supply. Water is now obtained from wells and sewage is disposed of in cess-pools. There need be no great difficulty in getting a franchise for water works, if the sewerage question could be properly handled. It is to be again brought up at next meeting of the village council. Population is about 13,000, a large proportion New York business men.

CATONSVILLE ARTESIAN WELL.—The work of boring an artesian well at Catonsville near Baltimore to obtain the water necessary for the proposed Catonsville water-works is being actively pushed. The well is on the land of Mr. Joseph W. Cone, on the highest hill in Catonsville, a little apart from the turnpike. The depth of very nearly 250 feet was obtained, but as the supply of water was only about fifteen gallons a minute, it was decided to bore deeper. Mr. Cone is building a water tower fifty feet high with a tank calculated to hold 30,000 gallons.

PUMPING LARGE QUANTITIES OF SEA WATER BY WINDMILL POWER.

A. J. Corcoran, of this city, is now at work making drawings in detail for a large windmill to be used for pumping water from the sea on the coast of Brazil. This water is required for the manufacture of salt, and the windmill elevates 2,400 gallons per minute, working a gang of ten pumps, and arranged so that one, two—any part—or all of them may be worked at will. This is a most important point when it is a desired to obtain the best possible result as to the quantity of water delivered, during light, as well as heavy wind. The cylinders of these pumps are made of copper mounted upon brass and large cast-iron bases and weigh some 1,200 pounds each.

The windmill—though made of the same material—and doing substantially the same work as a steam engine, is, in construction, more like a ship, as the greatest strain is at a distance from its center of gravity—and in the case of the windmill—its weight is also. Windmills are often erected on frame works 125 feet high, and it is essential in their construction that the material used shall combine strength and the least possible weight. In several instances, however, the weights of single pieces of pumping windmills such as will be required to pump the quantity of water named above, have averaged from 1,600 to 2,500 pounds—although every effort has been made to decrease the weight, without loss as to strength.

PORTLAND, ORE.—A company with $1,000,000 capital has been formed to supply the city of Portland, Or., with water.

A TEST was made recently on the well which is to supply the reservoir at Ware, Mass., and it was found that in 24 hours 620,000 gallons of water had been pumped out or about 430 gallons a minute. Frank L. Fuller, of 7 Exchange Place, Boston, is Engineer of these works.

MARSHALL, TEX.—The Marshall Gas and Water supply company have organized under a charter from the State, and elected the following board of directors; E. Key, E. J. Fry, M. L. Weisman, W. H. Hope, of Marshall and T. G. Macy, of New York. Officers—President, E. J. Fry; vice-president, E. Key; secretary and treasurer, W. C. Pierce. The city council by ordinance granted right of way through the streets to the company. The company entered into a contract with a New York Construction company to build gas works for $25,000, active operation to begin within sixty days and the works to be completed within nine months. T. G. Macy is in New York to prepare for carrying out the contract.

POULTNEY.—The *Albany Evening Journal* has received the following: "There is an error in your item headed: 'New York Water for a Vermont Village.' The facts are that Crystal lake, together with the right of way across the intervening country to the Vermont line for purposes of laying and maintaining a main, was secured something over a year ago by private citizens of Poultney, Vt., and the rights, secured at a nominal sum, were recently offered to the village at actual cost. At a meeting of the fire districts Wednesday 8th, by a large majority vote the offer was accepted and an appropriation of $25,000 made to complete a system of public water works. The lake is situated less than two miles distant, at an altitude of over 300 feet above the village level, has a storage capacity of about 35,000,000 gallons and an uninhabited watershed of 130 acres, furnishing a most excellent quality of water." B.

CHICAGO, ILL.,—An effort will be made to induce the Legislature at its next session to modify the existing State laws affecting municipal indebtedness so that Chicago may be enabled to carry out a broad scheme of public improvements. This is now made impossible by the limit placed upon the expenditures within the present tax levy. Several important public works, including an improved water supply and a complete change in the present sewerage system, are contemplated, both of which will necessitate a large expenditure. In addition to these the construction of bridges and pavements is a pressing need. It is contended that the only possible method for carrying on these works is by raising money upon bonds. To popularize the plan it will probably be urged that the bonds will be issued in small amounts and be sold to people of small means, not allowing them to be absorbed by syndicates, and that by this method the holders will have a direct interest in the affairs of the city.

JACKSONVILLE, ILLS.—More water is wanted and on Friday evening, September 3, the Council discussed the merits of an additional reservoir. The mayor said that a great many persons had spoken to him on the subject, urging that immediate action be taken Among those who had been to him were some of the heaviest tax payers in the city, and he felt that the general demand was for increased storage facilities, now that we have the pumping works and all the appliances necessary for the running of the water works.

Ald. Hall again remarked that the enterprise would be one of considerable magnitude, involving the outlay of a good many thousand dollars, and he thought it the course of wisdom to have the best engineering talent employed in the preliminary arrangements, so as to be sure we are right before we go ahead.

The general sentiment seemed to be in favor of a second reservoir, and when the committee now investigating the subject makes its report, definite action will doubtless be taken. There is also a strong sentiment in favor of putting in meters.

ARTESIAN WELL.—The Redfield papers issue artesian illustrated editions glorifying over the great success of its bore, securing a splendid flow of soft pure water, at a depth of 954 feet. It is said to be free from salt and mud and has a pressure of 200 pounds to the square inch, with water enough for 20,000 people.

# NEWS OF THE WEEK.

## CONTRACTING.

**Courthouse Letting.**—Sumter county Ga., is going to have one of the best court-houses in the State. The contract has been let to Mr. A. McGilvray, of Atlanta, for $29,500. The work will probably commenced about the first of October. The clock tower will be about 100 feet high, the house above 100x140 feet, built of brick on a granite basement.

**Excavation and Masonry for New Prison Enclosure in Philadelphia.**—On September 14th the Common Council of Philadelphia approved a contract with R. A. Malone, of Lancaster, Pa., to do the excavation and construct the masonry of a main enclosure wall for the new prison. The prices bid were as follows: Excavation, 40 cents per cubic yard, masonry in foundations, $4.90, and masonry above foundations, $5.90 per cubic yard. This main wall will be about 1,727 feet long, and the foundation wall will be 8 feet wide on top and 10 feet at bottom. Above the foundations it will be 7 feet wide at bottom and 3½ feet at the top and 35 feet high above grade.

**The Bids all too High.**—The Board of Managers of the Hudson River State Hospital, at Poughkeepsie, have been considering proposals for the erection of new buildings, as authorized by the last Legislature. Twelve bids had been received and most of the bidders were present when the bids were opened. As the law authorizing the buildings positively required that they must be completed at a cost not to exceed $125,000, and the lowest bid being $144,640, it was impossible to accept any of these bids, and those present were so notified. After considerable discussion the whole matter was referred back to the Building Committee, with instructions to make such change as may be necessary and readvertise for proposals. The changes in the plans will be made in a few days, and it is hoped that the contract can still be made in time to have the work begun and pretty well advanced before winter sets in.

### Railroads Bridges and Canals.

**Denver, Memphis & Atlantic.**—COFFEEVILLE, KAN., August 31.—The track of this road reached this place at noon to-day, and work is being rapidly pushed through the city to the west.

**New Narrow Gauge R. R.**—A survey is being made for a narrow gauge road from Bath, Me., to Smal Point. Gen. Bodwell of the Bodwell Granite Co., Portland, Me., is the promoter of the scheme.

**R. R. Tie Contract.**—A tie camp has been established on the north fork of the Sun river Montana, to get out about 400,000 ties for the railroad from Benton to the Canadian Pacific.

**Ohio and Northwestern River R. R.**—At a meeting of the Directors held at Portsmouth, Ohio, Sept. 2nd, the President was directed to immediately put a corps of engineers on the river line below Portsmouth, and agents to secure the right of way.

**Kansas, Nebraska & Dakota.**—The rails for the Northern Division of the Kansas, Nebraska and Dakota Railroad have arrived at Topeka and track-laying will begin at once. The grading in Shawnee county is almost completed. The new line is expected to be in operation November 15.

**Extending Their Lines.**—Important railroad extensions were reported on Wall street on the 14th, as having been settled upon. The Bee Line road is to be extended to Kansas City from Indianpolis, in accordance with plans and surveys along the north shore of the Missouri river laid out by President Devereux before his death. It is said that the Vanderbilts will engage in this enterprise to the extent at least of bridging the Mississippi at Alton, Ill.

[We know that some company is about putting nearly a score of parties in the field. The matter is kept so quiet that we have not learned the name of the Chief Engineer, who is in New York making up the parties. We believe the above from the daily papers of Wednesday is about correct.—ED. ENG. NEWS.

**The Commerce Street Bridge.**—At the council meeting last evening a communication from the street board in reference to the Commerce street bridge was read. It stated that the board had been instructed to repair the bridge at a cost not exceeding a certain sum. Mr. McClay was willing to do the work at that figure but died before a contract could be made. The lowest bid which could afterward be obtained was in excess of the sum allowed. The street board found that the old bridge was so far gone that no repairs would make it good for any long use, and being unable to get it repaired for the sum at there disposal, advertised for proposals for a new iron swing bridge. The lowest bid was one of $7,300 for a bridge of 80 pounds capacity per foot with $950 added for iron joists. A bridge of 100 pounds per foot capacity would add $900 to the cost but was recommended by the street board. The report closes with the recommendation of the passage of a resolution empowering the street board to contract for the work.

Alderman McGovern said he opposed an appropriation but favored authorizing the street board to advertise for bids. He moved to strike out the part calling for an appropriation.

The matter was tabled. Later it was taken from the table and it was voted that the bids for the work be submitted to the court of common council.—Hartford, Ct., *Courant*, 14th.

**Georgia R. R.**—Georgia is having a genuine railroad "boom." New roads are being not only projected, but built in every direction.

**The Chalmette Road.**—There is a hitch in the work on the Chalmette road. Mr. Fremaux, who was selected by the War Department to submit specifications for the construction of the road, has sent a report which calls or an outlay somewhat exceeding the appropriation of $25,000. Col. Batchelder will send an engineer of the department to New Orleans, who will confer with Mr. Fremaux.

**The Frisco.**—Col. J. Fruin, of the Fruin-Brambrick Railroad Construction Company has arrived with a large force of teams from Fort Smith, to work on a forty-seven mile contract on the St. Louis and San Francisco Railroad, in the Indian Territory, just north of Red river. There are now nearly 8,000 men and teams at work on the line between Fort Smith and Paris.

**Belleville, Ont.**—The harbor dredging at Belleville is to consist of a long channel 250 feet wide from a point a short distance south of the lower bridge, heading a little to the westward, through the gravel bar which fronts the western branch of the river out into the bay until ten feet of water is reached. This channel will be about three thousand feet long.

**Portland Harbor.**—The U. S. Engineer office at Portland, Me. is busy preparing for the work of dredging out Back Cove to give increased water front available for large steamers, the present wharves being overcrowded. Major Jared Smith is the U. S. Engineer in charge, and Mr. A. Both is Assistant Engineer. Soundings have been taken and the results are being platted for use.

**Minneapolis Bridge.**—Work has been begun on the steel-arch bridge, beginning with the excavation for the east abutment. The masonry work will not be gotten under way for two or three weeks yet. The arch will be three-hinged. The span is 258 feet between center pins and the center of the bridge will be at an elevation of 25 feet above the ends. The end posts are 30 feet in height, panel lengths, 1,843 feet. The structure will be of iron and wood, except the bottom cords and pins, which will be of steel. There will be sidewalks 12 feet wide each side of the bridge, which will be 80 feet wide The center pier will have a foundation of concrete, and will be protected by granite ice-breakers. The other breakers will be of Mankato stone. The dimensions for the center pier foundations are as follows; 144 feet long and 30 feet wide. Part of the present Manitoba will have to come down in order to build the west abutment.

**Bloomsburg & Sullivan Railroad.**—Preliminary surveys for the Blomsburg & Sullivan R. R., of which John A. Wilson, of Philadelphia, is Chief Engineer, were started on July 27th from the junction of the D. L. & W. R. R. at Bloomsburg, under the direction of W. S. Lutz as Principal Assistant and location completed by the latter part of August. The road runs up the beautiful and prosperous valley of the Fishing creek, which empties into the Susquehanna river, a short distance below Bloomsburg, following the east side of the valley, passing through the towns of Bloomsburg, Light street, and Orangeville, crossing Huntingdon creek near its mouth, on the opposite side of the valley from Forks and Stillwater, crossing the Fishing creek at Benton and through that prosperous little village, on up to the immense lumber regions of the North mountain, there to connect at Berneee with a branch from the L. V. R. R. Work has been started above and below Orangeville, below Huntingdon creek and about three miles above Bloomsburg. Track will be laid to standard gauge and is expected to be ready for trains by next spring. The road will open up one of the most prosperous agricultural valleys in the State, and the timber resources of the North mountain, which are unbounded, will be opened up to a profitable market.

**Asiatic Railway Schemes.**—Amongst the flies, small and great, now buzzing round the sealed honey-pot of Asiatic railway enterprise is an American gentleman named Williams. His scheme is a revival of that of General Klapka, and he is connected with the adventurous band of capitalists who, some time ago, proposed to build a ship railway from El Arish to Suez. General Klapka's railway scheme was based upon grants of land which the Government was asked to make to the concessionaires, and in Mr. William's *rechauffe* the proposed grants extend to 20 miles on either side of the railway. For every mile of railway, therefore, the applicants want some 40 square miles of land, so that if they build 3,000 miles of railway they would, according to their plan, be entitled to 120,000 square miles of land, or, in other words, a territory 10 times as large as Belgium. The scheme is interesting because of the manifestly hearty appetites of its promoters; but it may be questioned whether the State owns one entire sixth of the area of Asia, and whether, if it does possess it, it would be anxious to make a present of it to Mr. Williams. If the Porte is really desirous of having its railway system of Asia Minor rapidly and satisfactorily completed, it should address itself to first rate men and offer fair terms. How railways are to be had is shown by the example of Russia; there is no mystery or difficulty about the matter; all that is necessary is that the Government should make up its mind what it wants and be willing to pay a fair price for it. A financial combination not too onerous for the Turkish budget is easily discoverable.—*Herapath Journal*, Aug. 28th.

**Greek Railway Projects.**—M. Gotteland, chief engineer of the French Public Works Mission at Athens, has submitted to the Greek Government the plans of a projected railway from Nadplia to Calamata, by way of Tripolitza. The line is to be 181 kilometres long, and is estimated to cost 21,000,000fr. The line from Kiatos to Xylocastron to Kamaris 21 kilometres, and that from Milos to Argos 10 kilometres, will be open for traffic this autumn.

**New England R. R. Items**—Construction has begun on a road to be three miles long from Rockport to Westport, Camden, Me. It will be known as the Lime Rock railroad.

It is understood that work will begin very soon on the new mountain road from North Conway, N. H., to the summit of Mount Kearsarge.

The successful initiation of the combined horse and steam railroad between Adams and North Adams has revived the talk at Pittsfield about a steam road to Lanesboro. It is thought that if anything is done a part of the route surveyed some years ago for a line from Pittsfield to Williamstown will be adopted.

**Memphis, Garden City and Colorado R. R.**—Incorporated on the 2nd, to build and operate a railroad and telegraph line from near Arkansas City through the counties of Cowelly, Sumner, Sedgwick, Kingman, Harper, Barber, Pratt, Comanche, Kiowa, Clark, Ford, Mead, Finney, Wichita and Greely, by way of Garden City, Kan. The shops and headquarters of the road are to be located at Garden City. Directors—A. M. McLachlen, Washington, D. C.; K. M. Painter Meade Center; F. C. Delamator, Garden City; C. J. Jones and E. G. Larch, Garden City. Capital stock $5,000,000.

**Kansas City & Omaha R. R.**—Hon. John M. Ragan, Hastings, attorney for this railroad company, has been negotiating for the right of way for the new railroad and has secured the same through Sutton, Neb.

The contract for the grading was let last week between there and Fairfield, and the cars are to be running by Christmas as far east as Sutton.

The surveying party have just completed the survey to Bradshaw, at which point the Union Pacific surveyors will run the line from Stromsburg. It is reported that the Rock Island surveyors are running a line from Beatrice via Geneva and Sutton to Grand Island, which is the same route viewed by some of the officials last summer.

**Iron Ties.**—Speaking of iron ties, Mr. Wm. H. Brown, Chief Engineer of the Pennsylvania Railroad says that his company have some iron ties in use on thier Filbert street extension since 1880; last year they laid about 400 or 500 of them on the four and one-half degree curve in the West Pennsylvania yard, where 134 fast passenger trains pass over them every twenty-four hours. The ties they have been using cost from three to four dollars each. As long as good white oak ties can be procured for not exceeding one dollar apiece he would not recommend the adoption of iron ties, although they give perfect satisfaction and are no more trouble to keep in line and surface than wooden ties.

**New Kansas R. R.**—During the past week the Memphis, Garden City & Colorado Railroad was incorporated in Kansas, by gentlemen of Garden City, Kan., Chicago, and Washington, D. C. It will be a part of the East Tennessee, Virginia and Georgia system and will connect with the Memphis, Arkansas & Kansas, which is projected by the E. T. V. & G. R. R. from Memphis to Carrol Co., Ark. The directors are: A. M. McLachlen, Washington, D. C.; F. C. Delamater, Chicago, Ill.; Hon. C. J. Jones, Garden City Kan.; Edw. Lauk, Garden City Kan; Hon. R. M. Painter, Meade Center, Kan.; Chief Engineer. E. R. Shnable. Capital $5,000,000.

**Gainesville, Henrietta & Western R. R.**—At a meeting held at the Lindsay House, Gainesville, Tex., the stockholders of the above railway, Aug. 31st., organized and decided upon a route, elected a directory and officers, and ordered the construction at once. The following directory was chosen; J. W. T. Gray and H. L. Lewis, of Henrietta; G. J. Gooch, Houston; H. M. Hoxie and B. S. H. Smith, St. Louis; J. Herrin, N. W. Hunter, Palestine; F. M. Daugherty, Gainesville; J. M. Lindsay, Jas. A. Baker, Houston; Col. R. C. Foster Denison. An election of officers resulted in the choice of the following: H. M. Hoxie, President; J. Herrin, Vice-President; B. S. H. Smith, Secretary and Treasurer; J. M. Lindsay, Assistant Secretary and Treasurer. The road will begin at Gainesville and run westward through Henrietta to the Center of Baylor county.

**Chicago, Milwaukee & St. Paul Railway.**—This company will have 120 miles graded, with sixty miles o bridges, from Ottumwa, Ia., south, toward Kansas City by November 1, with sixty miles of track down by January 1, 1887, and expect to complete the line from that place to Kansas City (215 miles), widening the bridge over the Missouri river by July, 1887. All the entire line (three divisions) contracts are moving more than a million yards per month.

**Natchez, Jackson & Columbus R. R.**—President Clarke and General Manager Mann, of the Illinois Central railroad, were in Columbus, Miss., on August 29th and 30th, coming by private conveyance from West Point to look over the route of the proposed branch from their line to this point. An enthusiastic meeting was held at the court house, Monday morning, when Mr. Clarke delivered an encouraging speech on the subject. Reliable authority states that engineers will be in the field within a few weeks, and that there is no doubt about the road being built at once. A special from Natchez, says that "papers were received August 28th, which ensures the completion of the Natchez, Jackson & Columbus now within twelve months." With the completion of the Georgia Pacific and their other two important lines, Columbus will make "magic" strides, and will continue to be the leading city in east Mississippi, if not the largest in the State. Business men here were never more encouraged, as the prospect for the town has never been so bright.

**New R. R. Switch.**—Mr. P. Nolan, roadmaster of the Alabama Great Southern, has recently invented a switch for which great merit is claimed. It is being tested on that road. The most admirable feature of the switch, is that it leaves the main line track undisturbed or continuous, the rails on the main line being spiked just the same as any other portion of the track. When not thrown for the siding, no portion of the switch touches the main line—a feature existing in no other switch—and consequently there is no wear of the rails. In the ordinary railroad switch, whether set for the main line or the sideing, there is always some portion of it constantly in use. This is entirely obviated in Mr. Nolan's patent, thus increasing the life of the switch for an indefinite length of time. The ordinary split rail switch costs about $55; the Nolan switch $30, an economical feature that will recommend it at once.

In construction, the Nolan switch does not differ so very much from the ordinary switch, its peculiar features being a raised rail on one side and a split rail on the other, both of which come into use only when set for the siding.

**Northern Pacific Extensions.**—ST. PAUL, MINN., Sept. 14 [Special].—Gen. Adna Anderson, Chief Engineer of the Northern Pacific, has left St. Paul for Helena, M. T., to award the contract for building the first thirty miles of the proposed Helena, Boulder Valley and Butte Road. This will carry the line well into Boulder Valley and to a point ten mile beyond Boulder City. The line is to be eventually continued to Butte. General Anderson, speaking of the work upon the Northern Pacific's extensions and branches, said:

"Upon the Cascade division we hope to have the section from Ellensburg to the tunnel ready for the next inspection. This will be between the middle of October and the 1st of November. The length of this section is forty-five miles. Work upon the tunnel is progressing very satisfactorily. Contractor Bennett's men have pierced the mountain for a distance of 1,400 feet. This is about one-seventh of the entire distance. Gangs are working from both ends and will meet each other early next year. The Spokane & Palouse branch, forty-three miles, has been completed and turned over to the operating department. Trains are now running south from Spokane Falls to Bellmont, the Southern terminus of the line.

"The company is building another branch, which leaves the main line twenty miles this side of Spokane Falls. This is the Spokane and Idaho Road, and is intended to develop the Cœur D'Alene Mines. The line runs to Cœur D'Alene City, thirteen miles; there water connection is had. The route from that point is across Cœur D'Alene Lake and up the Cœur D'Alene river to Kingston, from which point a narrow gauge road is now building along the south fork of the river. Surveys have been made as far as Milo, twenty miles, but the road will be continued beyond that point into the very heart of the mining district.

"At some future day it is very likely the company will build East, from Kingston to the Spokane & Palouse line. This will carry the line south of Cœur D'Alene Lake, crossing the St. Joe river somewhere near its mouth. This country is very fertile and is thick with valuable timber. On the Helena and Red Mountain branch the track-layers are making good progress. On the James River Valley extension, south from Lamoure to a connection with the northwest the grading is about done, but the track-laying will not be finished before the middle of October."

### Maintenance of Way.

COUNCIL BLUFFS, Iowa.

ED. FOREMAN:—I see in last issue a Foreman remarks that if any Foreman knew a better way of doing work than others they never give it away. I will make a start this time, not that I know any more than any one else. I will do this for information.

First—We will commence a thing. Foremen should always be watchful when or before starting to work in the morning. See that you have all the necessary tools on your hand-car to suit your work for the day and especially see that you have danger signals, such as flags and torpedoes. Now we will commence on surfacing track.

To make good headway with surfacing your track commence at one end of your section, the end farthest off from where you live if practicable, commence as early in Spring as possible. Then a Foreman should surface track at least five days out of every week and take the other day to fixing up low joints and other things necessary. When surfacing see that your ties are well spaced, divided up evenly along under the rail. Keep the biggest ties for your joints and have them thicker around the joints than any other place in the rail. I always, when I raise a few rails, go along with a bar and spike; maul and drive all the spikes on the good ties down to the rail so as to keep the rail firm on the ties. Don't raise the track only enough so that you can tamp it good and get the dirt well under the ties. You want to notice, if you use plain splices on your joints, if they are bent through the joints being low before. If they are bent turn the splice upside down. Tamp your joint tie good with the tamping bars, the result is the joint will stay up as-long-again.

After you have your days raising raised and tamped, line up your track in good line, as good line is one of the chief things in a track and good gauge. Be sure and keep your track in good gauge. If you have any low places in your track they won't swing a train as bad as when it is out of line consequently good line and good gauge is one of the chief things. As you go along the Foreman can always tighten the bolts on the joints while the men are tamping. Next is dressing your track or filling it in the center. Go in the bank and fill with good soil where you have soil ballast. Never fill the center higher than the top of your rail and slope it down at both sides so that when you come to the out end of the tie that you have dirt perfectly clear from the end of the ties to allow the water to pass away from your track. Never allow the dirt to accumulate at the end of the ties as it always keeps the track soft, consequently it gets low and out of line and swinging in every case. You should always use the spirit level and have your track even at both ends.

YARD FOREMAN.

*The Section Foreman.*

### Structural Iron.

The amount of Beams and Channels in demand in Chicago, at this season of the year is rather surprising The number of buildings erected during the summer is far in excess of anticipation, and largely of sizes for which the iron could be furnished from yard. Within the last ten days designs for three more large buildings have been set afloat for which the material will be required during the fall and winter months. Bridge work is coming in very freely, and an excellent trade in shapes is the result. The following quotations remain unchanged: Beams and Channels, combination price, 3.10c; store price, 3.50c; angle iron, 2.40; T Iron, 3c; Fitch Plates, 2¼c @ 2¾c.—*Iron Age.*

IT is stated by good authority that the natural annual increase in the network of gas and water pipe in the city of New York calls for 6,000 tons of cast-iron pipe annually, and when it is considered that the other large seaboard cities take correspondingly large quantities it will be understood how heavy is the consumption from this source alone. It is estimated that the Croton Aqueduct, with all of its ramifications, will next year year require no less than 7,000 tons of pipe.—*Iron Age.*

WHERE SOME MEN ADVERTISE.—A man by the name of Warner has been arrested by United States officers at Jackson, Mich., on complaint of Post Office Inspector Purcell on a charge of using the mails for fraudulent purposes. Warner claimed to publish a daily and weekly paper and to circulate from 35,000 to 60,000 copies. He would write to business men requesting goods in exchange for advertising, receive the goods, print advertisements in a few papers, and sent a copy to the advertiser. He has a little printing-office, and is said to have been carrying on the business for the past ten or fifteen years, and to have secured a large amount of goods of all kinds, including quite an extensive library. The existence of such a paper with such a circulation is unknown to the people of Jackson

# CONTRACTORS INTELLIGENCE.

## Engineering and Building Materials.

### WHOLESALE PRICES.

**Chicago, September 16, 1886.**

#### IRON.

Quotations given by Jones & Laughlin.

| | | | |
|---|---|---|---|
| STRUCTURAL IRON. | | | |
| Angles | 2.30 | @ | 2.40 |
| " | 2.40 | @ | 2.50 |
| Tees | | | 3¼c. |
| Beams, channels, American | | | 3¼c. |
| Tank plates | | | 2.40 |
| Shell plates | 3.00 | @ | 3¼c. |
| Steel plates, Tank | | | 3c. |

Quotations by Fieldhouse, Butcher & Belden.

| | | | |
|---|---|---|---|
| WROUGHT-IRON PIPE. | | | |
| Butt welded, black.....Discount | | | 42½ |
| " " galvanized... " | | | 32½ |
| Lap " black... " | | | 55 |
| " " galvanized... " | | | 37½ |

Quotation by National Tube Co.

| | | | |
|---|---|---|---|
| Boiler Tubes | | | .50 |

Quotations by North Chicago Rolling Mills Co.

| | | | |
|---|---|---|---|
| RAILS. | | | |
| Steel | $37.00 | @ | $38.00 |
| Old Rails—Iron | 21.00 | @ | 22.00 |
| " " —Steel | 20.00 | @ | 21.00 |
| R. R. spikes | | | 2.40 |
| R. R. splice-plates | 1.90 | @ | 2.00 |
| R. R. track bolts, square nuts | | | .3c. |
| Barb wire fencing, galvanized | | | .4c. |
| " " painted | | | .3½ |

Quotations given by H. Green & Bros.

| | | | |
|---|---|---|---|
| CORRUGATED IRON-SHEET. | | | |
| Wire gauge | 16 to 20 | 24 | 26 |
| Black, per lb | 3½ | 3½ | 3¾ |
| Galvanized per lb | 6 | 6¼ | 6¾ |
| Nos. 28 | | 6¾ | 6¾ |
| NAILS. | | | |
| Iron, per keg | 2.10 | | |
| Steel, " " | 2.20 | @ | 2.25 |

#### METALS.

| | | | |
|---|---|---|---|
| COPPER. | | | |
| Lake Superior | | | 10.25 |
| LEAD. | | | |
| Com. Domestic | 4.75 | @ | 4.80 |
| Lead Pipe | .06¼c | @ | .06¾ |
| Tin-Lined Lead Pipe | .15 | | |
| Sheet Lead | .07¼ | | |
| ZINC. | | | |
| Sheet | 5.65 | | |

#### BRICK.

Quotations given by Lockwood & Kimball.

| | | | |
|---|---|---|---|
| Common.....per M | 8.00 | @ | 8.50 |
| PRESSED. | | | |
| Chicago, Anderson | 18.00 | @ | 27.00 |
| Indiana | 16.00 | @ | 22.00 |
| Perth Amboy, Buff | | | 50.00 |
| " Mottled | | | 50.00 |
| Tiffany | 22.00 | @ | 30.00 |
| St. Louis | | | 27.00 |
| Trenton | 40.00 | | |
| Philadelphia | | | 45.00 |
| Baltimore | | | 55.00 |
| Milwaukee | | | 25 00 |
| Zanesville | | | 30.00 |
| " Enamelled | | | 30.00 |
| Toledo Red, common | | | 12.00 |
| " " stock | | | 17.00 |
| Fire Brick | 25.00 | @ | 30 00 |

#### LIME, ETC.

| | | | Per Cask. |
|---|---|---|---|
| Chicago Lime | .65 | @ | .75 |
| Wisconsin " | .90 | @ | 1.00 |
| Hair—cattle, per bu | .20 | @ | .25 |
| " —goat, " " | | | .40 |
| Sand, Lake shore, per yd | 1.00 | @ | 1.25 |
| Plaster of Paris | 2.00 | @ | 2.50 |

#### CEMENT.

| | | | |
|---|---|---|---|
| Portland | | | 3.50 |
| Milwaukee, Utica, Louisville, Akron | | | 1.25 |
| Keene's Coarse | 7.50 | @ | 9.00 |
| " Fine | 11.00 | @ | 12.00 |

#### STONE.

Quotations given by Chicago Stone Co.

| | | | Per cubic foot. |
|---|---|---|---|
| LIMESTONE, Promiscuous blocks, f. o. b. cars; Chicago. | | | |
| Blue Bedford | | | .65 |
| Buff | | | .50 |
| Joliet | .35 | @ | .50 |
| Lemont | .40 | @ | .50 |
| FOUNDATION. | | | |
| Dimension, on dock | .16 | @ | .20 |
| Rubble, per cord | .20 | @ | .25 |
| Sidewalks, laid, 8" to 12" } sq. ft. | .65 | @ | .75 |
| " " 6" to 8" } | | | |
| Planed | .40 | @ | 1.00 |
| SANDSTONE, Promiscuous blocks. | | | |
| Amherst | .60 | @ | .75 |
| Berea | .55 | @ | .65 |
| Philadelphia brown stone | | | 1.50 |
| Connecticut " " | | | 1.50 |
| Carbondale | | | 1.10 |
| Malone Blue Euclid | .55 | @ | .65 |
| New York Bluestone | .35 | @ | 1.40 |

#### MARBLE.

Quotations given by Georgia Marble Co.

| | | | |
|---|---|---|---|
| Cherokee, and Creole | | | 1.70 |
| Ettowah | | | 2.20 |

Quotations given by Davidson & Sons.

| | | | |
|---|---|---|---|
| Rutland | 3.00 | @ | 9.00 |
| Concord | | | 5.25 |
| Sutherland Falls | 2.50 | @ | 5.50 |
| St. Lawrence | | | 5.60 |
| East Dorset Italian | 2.50 | @ | 4.50 |
| Mountain Park | 2.25 | @ | 6.00 |
| Vermont | | | 3.00 |
| Tennessee, Red | 7.00 | @ | 9.00 |
| " Concord | 2.50 | @ | 5.00 |
| Italian, Veined | | | 4.90 |

#### SLATE.

Quotations given by Edward Johnson, 14 and 16 East Van Buren street.

| | | | |
|---|---|---|---|
| Green Roofing, per square | | | 5.20 |
| Purple " " | | | 6.00 |
| Red " " | | | 12.50 |
| Black Lehigh " " | 5.25 | @ | 5.50 |
| " Bangor " " | 5.50 | @ | 5.80 |

#### LUMBER, Car Lots.

| | | | Per M. |
|---|---|---|---|
| THICK CLEARS AND SELECTS. | | | |
| Mixed Lengths, Dry.....Rough | 20.00 | @ | 47.00 |
| ONE INCH FINISHING. | | | |
| Mixed Lengths, Dry.....Rough | 24.00 | @ | 47.00 |
| 12-INCH STOCK BOARDS. | | | |
| D to A | 23.00 | @ | 42.00 |
| Common Stock Boards | 11.50 | @ | 16.00 |
| BOX BOARDS, D to A | 22.00 | @ | 24.00 |
| FLOORING STRIPS, ROUGH, 6-INCH. | | | |
| 1st and 2nd clear | | | 30.00 |
| A Siding Strips | | | 30.00 |
| C and A Flooring " | 22.00 | @ | 30.00 |
| FLOORING DRESSED AND MATCHED. | | | |
| D to A, 6-inch | 17.80 | @ | 34.00 |
| No. 1 Fencing | 13.00 | @ | 15.00 |
| Norway, clear, C to A | 17.00 | @ | 22.00 |
| 8 and 10-inch No. 1 Boards, D and M | 14.50 | @ | 15.00 |
| C to A Partition D and M, 2 sides, 4 beads | 27.00 | @ | 30.50 |
| Beaded C and King, Tied | 14.50 | @ | 32.00 |
| Common and Cull. Boards, Dry | 11.00 | @ | 13.00 |
| Common and Cull. Fencing | 11.50 | @ | 13.50 |
| BATTENS. | | | |
| O. G. or Beveled per 100 lin. ft | .50 | @ | .70 |
| TIMBER, JOISTS AND SCANTLING. | | | |
| All 2x4, 12 to 24 ft | $12.00 | @ | $13.50 |
| " 2x6, " | 12.00 | @ | 16.00 |
| " 2x8, " | 12.00 | @ | 14.50 |
| " 2x10, " | 12.00 | @ | 16.00 |
| " 2x12, " | 12.00 | @ | 17.00 |
| 4x4 to 8x8 " | 12.00 | @ | 15.00 |
| 2 inch cull, plank, prom' width | | | 9.00 |
| 2x4 " " 12, 14 and 16 ft | | | 10.00 |
| BOARDS, ordinary dimensions. | | | |
| Pine, 1st quality clear | $46.00 | @ | $48.00 |
| " 2nd " " | 44.00 | @ | 47.00 |
| " 3rd " " | 42.00 | @ | 44.00 |
| Common | | | 13.00 |
| SIDING. | | | |
| Pine | 10.00 | @ | 21.00 |
| FRAMING TIMBER, Pine | 12.00 | @ | 17.00 |
| Laths " | | | 1.75 |
| Shingles " sawed | 2.10 | @ | 2.40 |
| " cedar | 2.00 | @ | 2.20 |
| Pickets, pine | 9.00 | @ | 19.00 |
| Posts, cedar | 9.00 | @ | 21.00 |
| Pine, yellow southern | 28.00 | @ | 35.00 |
| PINE, YELLOW GEORGIA, | | | |
| 1st and 2nd clear, 4 inch flooring | | | 35.00 |
| " " " " 6-inch " | | | 35.00 |
| Boards | 33.00 | @ | 35.00 |

#### HARDWOODS

| | | | |
|---|---|---|---|
| Ash, 1st and 2nd, 1 inch | 23.00 | @ | 25.00 |
| Maple, " " " " | 20.00 | @ | 21.00 |
| Walnut " " " " | 100.00 | @ | 175.00 |
| Oak White, 1st and 2nd, 1 inch | 16.00 | @ | 38.00 |
| " Red " " " | 22.00 | @ | 24.00 |
| Cherry " " " " | 65.00 | @ | 85.00 |
| Beech, Red " " " " | 25.00 | @ | 30.00 |
| Whitewood " " " " | 22.00 | @ | 28.00 |
| Birch, Red, 1st and 2nd, 1 inch | 23.00 | @ | 25.00 |
| Butternut " " " " | 30.00 | @ | 40.00 |
| Sycamore " " " " | 22.00 | @ | 25.0 |
| Gum " " " " | 20.00 | @ | 23.00 |
| Basswood " " " " | | | 20.00 |
| Hickory " " " " | 26.00 | @ | 30.00 |
| Elm " " " " | 14.00 | @ | 16.00 |
| Chestnut " " " " | 32.00 | @ | 37.00 |
| Rosewood, per lb | 3c. | @ | 15c. |
| Mahogany, Mexican, per ft | .15c. | @ | .30c. |
| " St. Domingo, per ft | .20c. | @ | .25c. |
| " Cuba, per ft. | .12c. | @ | .20c. |
| California Redwood Lumber | 42.50 | @ | 44.50 |
| " Shingles | 4.00 | @ | 4.90 |
| " Pine | 65.00 | @ | 75.00 |
| Mexican Spanish Cedar | 150.00 | @ | 300.00 |
| Georgia Cypress Lumber, 1st and 2nd clear | 35.00 | @ | 40.00 |
| Georgia Cypress Shingles | 3.75 | @ | 4.35 |
| CALIFORNIA OAK. | | | |
| Plank | 23.00 | @ | 25.00 |
| Timber | 24.00 | @ | 30.00 |

#### PAINTS.

| | | | Dry. | | In Oil. |
|---|---|---|---|---|---|
| Lead, White (American) Dry | | | 7 | | 7¾ |
| Zinc " " | | | 8, 10, 10 | @ | 12 |
| Red Venetian | | | 2.6 | | 12 |
| Vermillion | | | | 2 @ | 75 |
| India Red | | | | 15 @ | 20 |
| Yellow Ochre | | | | 6 @ | 10 |
| " Chrome | 12 | @ | 20 | 12 @ | 20 |
| Green " | 12 | @ | 15 | 10 @ | 16 |
| Black, Lamp | 8 | @ | 25 | 10 @ | 15 |
| Putty | | | | .2 Bladders | .3 |
| Blue, Ultramarine | | | .16 | | .35 |
| Whiting, dry | | | .1 | | |
| Litharge—American | | | .7 | | |
| Sienna, burnt | | | .9 | | .16 |
| Umber, burnt | | | .7 | | .16 |
| Oil, Linseed (raw) per gal | | | .44 | | |
| " " (boiled) " | | | .47 | | |
| Turpentine " | | | .38 | | |
| Varnish, coach | | | 1.25 | @ | 2.00 |
| " shellac | | | 3.25 | @ | 4.00 |

#### ASPHALT.

| | | | |
|---|---|---|---|
| BARBER ASPHALT. | | | |
| Pavements Laid: | | | |
| Without foundation, per sq. yd | | | 2.00 |
| With " " " | | | 3.00 |
| Asphalt Blocks: | | | |
| Macadam foundation, per sq. yd | 2.81 | @ | 2.97 |
| Without macadam foundation, per sq. yd | | | 2.75 |

# Contractors Intelligence,

**Reported by T. H. Boorman.**

## Engineering and Building Materials.

WHOLESALE PRICES.

**New York, September 16, 1886.**

### IRON.

| | | |
|---|---|---|
| STRUCTURAL IRON. | | |
| Angles | 1.95c | @ 2.10c |
| " steel | 2.35 | @ 2.45 |
| Tees | 2.35 | @ 2.45 |
| Beams and channels, American | 3.0 | @ |
| Tank plates | 2.10 | @ 2.20 |
| Shell plates | 2.4 | @ 2.5 |
| Steel plates, Tank | 2.70 | @ 2.75 |
| WROUGHT-IRON PIPE, PITTSBURG. | | |
| Butt welded, black Discount | | 45 |
| " galvanized " | | 35 |
| Lap welded, black " | | 60 |
| " galvanized " | | 42½ |
| Boiler tubes " | | 52½ |
| RAILS. | | |
| Steel (large lots at mill) | $34.00 | @ $34.50 |
| Old rails | 20.00 | @ 20.50 |
| Old rails, steel | 22.00 | @ 23.00 |
| R R. spikes | | 2.40c |
| R R. splice-plates | 1.80 | @ 2.00 |
| R R. track bolts, square nuts | 3.00 | |
| Barb-wire fencing, galvanized | 4.00 | @ 4.38 |
| " painted | | 4.00 |
| Corrugated iron | | |
| Nails | | |
| Iron, per keg | 2.10 | |
| Steel do. | 2.20 | @ 2.25 |

### METALS.

| | | |
|---|---|---|
| COPPER. | | |
| Lake Superior | 10.25 | @ 10.38 |
| Other Brands | 8.25 | @ 9.75 |
| LEAD. | | |
| Com. Domestic | 4.75 | |
| Lead Pipe | .06¼c. | |
| Tin-Lined Lead Pipe | .15 | |
| Sheet Lead | .07¼ | |
| ZINC. | | |
| Sheet | 5.60 | @ 5.85 |

### BRICK.

| | | |
|---|---|---|
| argoes (afloat) | | |
| Choice Brands | 7.25 | |
| Haverstraw per M. | 6.50 | @ 7.25 |
| Fishkill | 6.25 | @ 6.50 |
| Up-River | 5.50 | @ 6.25 |
| Jerseys | 5.75 | @ 6.25 |
| Long Island | | |
| Pale | 4.50 | @ 4.75 |
| FRONTS. | | |
| Croton, red | 11.00 | @ 15.00 |
| " dark | 11.00 | @ 15.00 |
| " brown | 10.00 | @ 14.00 |
| Philadelphia pressed | 27.00 | @ 28.00 |
| Trenton " | 25.00 | @ 26.00 |
| Baltimore " | 37.00 | @ 41.00 |
| Buff " | 33.00 | @ 35.00 |
| Enameled English | 85.00 | @ 130.00 |
| " American | 80.00 | @ 120.00 |
| Fire brick | 25.00 | @ 55.00 |
| " American, No. 1 | 30.00 | @ 35.00 |
| " " No. 2 | 25.00 | @ 30.00 |

### ASPHALT.

| | | |
|---|---|---|
| ROCK. | | |
| French, per ton | $20.00 | @ 25.00 |
| German | 15.00 | @ 20.00 |
| According to quantity or brand, and whether taken from vessel or store. | | |
| PAVEMENT. | | |
| Barber's Asphalt | $2.50 | @ $3.00 |

### LIME.

| | |
|---|---|
| Rocklock Cement Co.'s Ground | .80 |
| Rockland, common per bbl | 1.00 |
| " finishing | 1.20 |
| State, common | .85 |
| " finishing | 1.05 |
| Kingston, ground | .90 |
| Add 25c. to above figures for yard rates. | |

### STONE.

*Cargo rates at New York.*

| | | | |
|---|---|---|---|
| Amherst freestone, No. 1 | per cub. ft. | 0.95 | @ 1.00 |
| " " No. 2 | " | 0.75 | @ 0.85 |
| " " light drab | " | 0.80 | @ 0.95 |
| Berlin " in rough | " | 0.75 | @ 1.00 |
| Berea " " | " | | |
| Brown stone, Portland, Ct. | " | 1.00 | @ 1.35 |
| " Belleville, N. J. | " | 0.75 | @ 1.35 |
| Granite, rough | | 0.45 | @ 1.25 |
| Common building stone per load | | 2.00 | @ 3.00 |
| se stone, from 2¼ to 6 ft. lengths, per lin. ft. | | 0.40 | @ 3.00 |
| oncrete and macadam stone, Tomkins Cove, per cub. yd | | | $1.65 |

### SLATE.

| | | |
|---|---|---|
| Purple roofing | per square | 6.00 @ 7.00 |
| Green | " | 6.00 @ 7.00 |
| Red | " | 15.00 |
| Black Penna. (at New York) | " | 4.50 @ 5.00 |

### LUMBER.

Prices for yard delivery in New York.

| | | | |
|---|---|---|---|
| PINE, Common box | per M. | 18.00 | @ 20.00 |
| Choice | " | 65.00 | @ 70.00 |
| Tally plank, 1¼ in. to 2 in. dres'd, each. | | .44 | @ .50 |
| Tally boards, dressed com. | " | .28 | @ .30 |
| SPRUCE, Boards dressed | " | .25 | @ .28 |
| Plank, 1¼ in | " | .28 | @ .30 |
| " 2 in. | " | .38 | @ .40 |
| 2 in. dressed | " | .43 | @ .45 |
| Timber | per M. | 13.50 | @ 18.00 |
| HEMLOCK, Boards | each. | .18 | @ .20 |
| Joist, 2¼ × 4 to 4 × 6 in | | .16 | @ .44 |
| OAK | per M. | 55.00 | @ 65.00 |
| CYPRESS 1, 1¼, 2 and 2½ in | " | 35.00 | @ 40.00 |
| YELLOW PINE, Girders | " | 25.00 | @ 30.00 |
| Dressed flooring | " | 28.00 | @ 35.00 |
| SHINGLES, Extra shaved pine, 16in. | " | | |
| " sawed 18 in. | " | 5.75 | @ 6.00 |
| LATH, Cargo rate | " | 2.00 | @ 2.10 |

### PAINT.

| | | |
|---|---|---|
| Lead, white, American dry per lb | .04¾ | @ .06¼ |
| " " " in oil pure | .07 | @ .07½ |
| " English, B. B. in oil | .08¼ | @ .08¾ |
| " Red, American | .06½ | @ .07 |
| Litharge " | 05½ | @ .06 |
| Venetian red, American " | .01 | @ .01¼ |
| Indian red " | .08 | @ .10 |
| Vermillion, American lead " | .10½ | @ .11½ |
| Paris green " | .15 | @ .18 |
| Umber, Amer. raw and powdered per lb. | .01¼ | @ .01¾ |
| Drop black, Amer. | .07 | @ .13 |
| " " Eng. | .11 | @ .13 |
| Chrome green | .10 | @ .25 |
| Oxide zinc, American | .03¾ | @ .03¾ |
| " French | .05½ | @ .07¼ |

### CEMENT.

The following price current is made up entirely from quotations furnished us directly by the firms dealing in each brand; the prices are understood to be Wholesale in New York, subject to such special rates as large quantities may warrant:

| | | |
|---|---|---|
| CALVIN TOMKINS: | | |
| "Old Newark Co's." Cement | | $1.10 |
| BAETJER & MEYERSTEIN: | | |
| Hanover Portland | $2.60 | @ $2.65 |
| BELLONI & CO.: | | |
| Hemmoor "Crown" brand | | 2.50 |
| JAMES BRAND: | | |
| Burham | 2.25 | @ 2.50 |
| Fewen | 2.25 | @ 2.50 |
| BROOKS, SHOOBRIDGE & CO. | 2.45 | @ 2.60 |
| HOWARD FLEMING: | | |
| Gibbs' English Portland, 400 lbs. | 2.50 | @ 2.75 |
| K. B. & S. " " | 2.25 | @ 2.50 |
| Stettiner, German | 2.65 | @ 2.85 |
| Lagerdorfer, " | 2.45 | @ 2.75 |
| Fieve, A 1, Belgian | 2.35 | @ 2.50 |
| Roman | 2.75 | @ 3.00 |
| Keene's Coarse | 4.75 | @ 5.50 |
| " Fine | 7.75 | @ 8.50 |
| " Superfine | 8.50 | @ 10.00 |
| FISHER, ERSKINE W.: | | |
| Stettin (German) Portland Cement | 2.40 | @ 2.75 |
| GABRIEL & SCHALL: | | |
| Vorwohler "Lion" | 2.65 | @ 3.10 |
| HUDSON RIVER CEMENT CO. Rosendale | | 0 |
| JOHNSON & WILSON: | | |
| Saylor's American Portland | 2.15 | @ 2.45 |
| LESLEY & TRINKLE, Philadelphia, Pa.: | | |
| "Giant" Portland | 2.20 | @ 2.40 |
| Improved "Union" | 1.25 | @ 1.50 |
| Union | 1.10 | @ 1.20 |
| MARCIAL & CO.: | | |
| J. B. White & Bros. Coarse Keene's | 4.25 | @ 4.50 |
| " Superfine | 7.25 | @ 7.50 |
| " Portland | 2.65 | @ 3.00 |
| NEW YORK CEMENT CO.: | | |
| Rosendale | | 1.10 |
| N. Y. & ROSENDALE CEMENT CO.: | | |
| Rosendale, "Bridge" brand | | 1.10 |
| SINCLAIR & BAUSON: | | |
| Alsen's Portland Cement Works | 2.35 | @ 2.85 |
| K. B. & S. | 2.25 | @ 2.50 |
| STANDARD CEMENT CO | | |
| E. THIELE: | | |
| Dyckerhoff | 2.90 | @ 3.25 |
| UNITED STATES CEMENT CO.: | | |
| English Portland | 2.25 | @ 2.40 |
| German " | 2.00 | @ 2.15 |
| Standard | 1.50 | @ 1.65 |
| Windsor and Improved Rosendale | 1.00 | @ 1.10 |
| UNION AKRON CEMENT CO.: | | |
| Akron "Star" brand | 1.00 | @ 1.10 |

## MARKET SUMMARY.

Since our last the price of brick hardened a trifle but to-day, quotations are same as last given. The demand has not been quite so active, no new work of importance has been started though it is anticipated that several large enterprises will be commenced before the cold weather sets in and manufacturers are not uneasy about the prospect of placing their production at remunerative prices. The Lumber Market is fairly lively with Spruce in better demand, narrow random cargoes cannot be bought for less than $13.50 to $14.00 per M., with good schedules quoted $14.50 to $16.50 per M and as high as $18.00 for specially large size orders. The forest fires and lack of water have caused trouble in getting Eastern Lumber to this Market, and Lath are in active demand at $2.10 per M. with no arrivals and sellers anticipating a rise in price to $2.25 per M., a large quantity will be required for "up-town" buildings during the next few weeks. Yellow Pine is about as last week with random cargoes quoted $18 00 @ 19.50 per M., specials $19.50 @ 21.00 and dry flooring boards $21.00 @ 22.00 per M. Rosendale Cement meets with better inquiry, sales are reported at $1 10 per barrel, with sales of some brands to dealers at $1.85 per barrel. Portland Cement continues in excellent demand with sales according to brands and quantities from $2.10 @ 2.35 per barrel. Lime is quiet and moves slowly at $1.00 for common Rockland. Plaster and Hair are unchanged and in fair demand. The Hardware Market continues in a somewhat unsatisfactory condition, sellers want combination to prevent cutting rates which are quite uncertain, sales are fairly good with encouraging prospects for an increase in volume in the immediate future. We quote 10d. to 60d. nails at $2.00 per keg for car lots, $2 05 @ 2.15 from stores, the market is plentifully supplied and the demand light. Lead meets with but little inquiry and the market is weak, common offered at 4.70c. on the spot, with no buyers at over 4 65c. Pig tin is firmer but without much speculative demand, Straits selling at 22c. Tin plate moves slowly with a tendency to lower prices, forward deliveries are reported sold at 15c @ 20c. below present market quotations. Paints and oils are quiet, no changes in price reported, Linseed oil 43c. per gallon, Turpentine 33½c. @ 35½c. per gallon. Pitch and Tar sell in somewhat limited quantities at $1 50 @ 1.70 per barrel for Pitch and $1.90 to 2.40 per barrel for Tar according to size of order.

## BUILDING ITEMS.

Messrs. C. Abbott French & Co. report plans for a two-story and basement addition, 25x46, to be made to No. 27 Wooster street, for Mr. W. H. Cohen, also plans on the boards for an Ice house, 30x150, to be built at Long Branch for Mr. Wm. Lovell, at a cost not yet estimated.

Bids were opened last Saturday for the erection of the new buildings for the Hudson River State Hospital at Poughkeepsie, and ranged from $194 000 to $144,640, the latter being the estimate of Messrs. O'Reilly & Powers, of Poughkeepsie, all bids were rejected, the appropriation being only $125 000, plans are to be changed and new bids obtained.

Mr. Wm. H. Walker has been awarded the contract for building the new school house on Fiftieth street, between Ninth and Tenth avenues, for $38,989.

Mr. W. H. Huve has drawn plans for a three-story granite-front stable, 26.6x80, to be built for Mr. Isaac V. Brokaw, at No. 1 080 Madison avenue, at a cost of $27,000, John Banta, builder.

Mr. Wm. Graul is the architect for a six-story brick factory, 50.45 and 88, to be built at a cost of $30,000, for Mr. G. L. Jaeger, at Nos. 132 and 134 Mulberry street.

Mr. Wm. Rankin will build three five-story brick flats, 23x86, at Nos. 344 to 348 West Forty-fifth street, to cost $60 000.

Messrs. Schwarzmann & Buchman have drawn plans for seven residences to be built for Mr. Albert Buchman on the southeast corner of Sixth avenue and One Hundred and Twentieth street, to cost $130 000.

Mr. Wm. Bulkley is the contractor for alterations to be made at a cost of $20,000 to the factory Nos. 504 to 508 West Fourteenth street.

Mr. Edward E. Raht is the architect for alterations to be made to No. 104 Fifth avenue, for Mr. Joel B. Wolfe, to cost $6 000.

Mr. Oscar S. Teale has drawn plans for a Methodist Episcopal church, 60x80, brick and terra-cotta, to be built at a cost of $25,000, at Hackettstown, N. J.

Messrs. Hubert Pirsson & Co. have prepared plans for a one-story brick extension, 60x215, to be added to James & Kirtland's iron foundry, No. 774 Westchester avenue, cost $7,000.

Mr. George Martin Huss has drawn plans for a cottage to be built for Mr. Edward Kimble at New Rochelle, N. Y., to cost $6,500.

Messrs. Colleran & Bros. and E. & O. Perrine will build four five-story and basement brick and stone flats, 25x86, on the north side of Sixty-seventh street, west of Tenth avenue, at a cost of $70,000, from plans of Mr. F. A. Minuth.

Mr. Geo. A. Schellenger has drawn plans for a three-story brick store, 25x85, to be built on Fifth avenue, south of Fifty-ninth street, for Messrs. Ottinger Bros., at a cost of $20 000.

Mr. Oswald Wirz has drawn plans for a six-story double tenement, 25x75, to be built by Mr. Jobst Hoffman on the south side of Ninth street, between Avenue A and First avenue C, to cost $20,000.

Messrs. A. B. Ogden & Son are the architects for nine five-story stone and iron front flats, to be build on Seventh avenue, One Hundred and Twenty-third and One Hundred and Twenty-fourth streets, at a cost of $200,000.

Messrs. Berg & Clark are preparing plans for a frame residence to be built for Mr. John Van Santicoord, at Mount Vernon, to cost $7,500.

Mr. Joseph Ireland, No. 67 West Twenty-third street, reports plans on the boards for a two-story brick stable, 50x100, to be built by days work, on Forty-fourth street, near First avenue, for Messrs. M. Fleischaver & Bro. Mr. Ireland informs us that work has commenced on the stable which he designed for Mr. M. B. Phillips, at No. 1,380 Pacific street, Brooklyn, it is to be of brick, two stories high, 25x35. The plans for the Brush Electric Light Co. he has not yet perfected.

Mr. W. Holman Smith has on hand designs for alterations and an addition to be made to No. 228 Munroe street, for Mr. Joseph P. Smith.

Mr. Stephen J. Wright will build on the north side of One Hundred and Thirtieth street, east of Eighth avenue, four three story residences at a cost of about $50,000.

## TRADE NOTES.

STEEL RAILS.—No sales of any magnitude are reported outside of one lot of 3,000 tons by an Eastern mill from Foreign Blooms. We hear of a sale also of 3,000 tons of Foreign Rails to a southern road. The market for early delivery remains firm at $34.50 to 35.00 for round blocks, and $34.00 to 34.50 for December delivery, with $33.50 to 34.00 for the early months of 1887. It should be stated that nearly every old-established rail mill in the country has a certain number of customers who place their orders in the fall, giving the mills winter work, the rails being piled up to be delivered in the spring and summer. In consideration thereof the mills usually make a concession, since it insures to them much steadier work. In the east the leading railroads generally distribute heavy quantities in this way, the Pennsylvania, for instance, last year, placing 30,000 tons with three mills. Lower prices named for this business do not, therefore, in reality mean a decline in the market. So far as the indications go now, and they can be nowhere so well watched as at New York, there will be a very heavy amount of railroad building next year. It is known that a number of well-matured and well-backed projects are coming forward, and the belief is spreading that in spite of their large capacity the rail mills will have all they can do in 1887.

WROUGHT-IRON PIPE.—At no time this year have the pipe mills been so crowded as at present. The season for putting down pipe within the city (Pittsburg) limits closes on the 1st of November, and the natural-gas companies, who have more inquiries for gas than they can possibly supply, are anxious to get down all the pipe they can during the time in question. No change in prices since the 25th of last month, when the discount on Lap-Welded Pipe was reduced 2½ per cent. A further advance at next meeting is not improbable. Discount on Black Butt-Welded Pipe in carload lots and upward, 45 per cent; Galvanized do, 31 per cent.; Black Lap-Welded do., 51½ per cent.; Galvanized do, 40 per cent.: Boiler Tubes, 50 per cent. off; 3-inch Tubing, 14c. per foot, net; 5½-inch Casing, 45c. per foot.